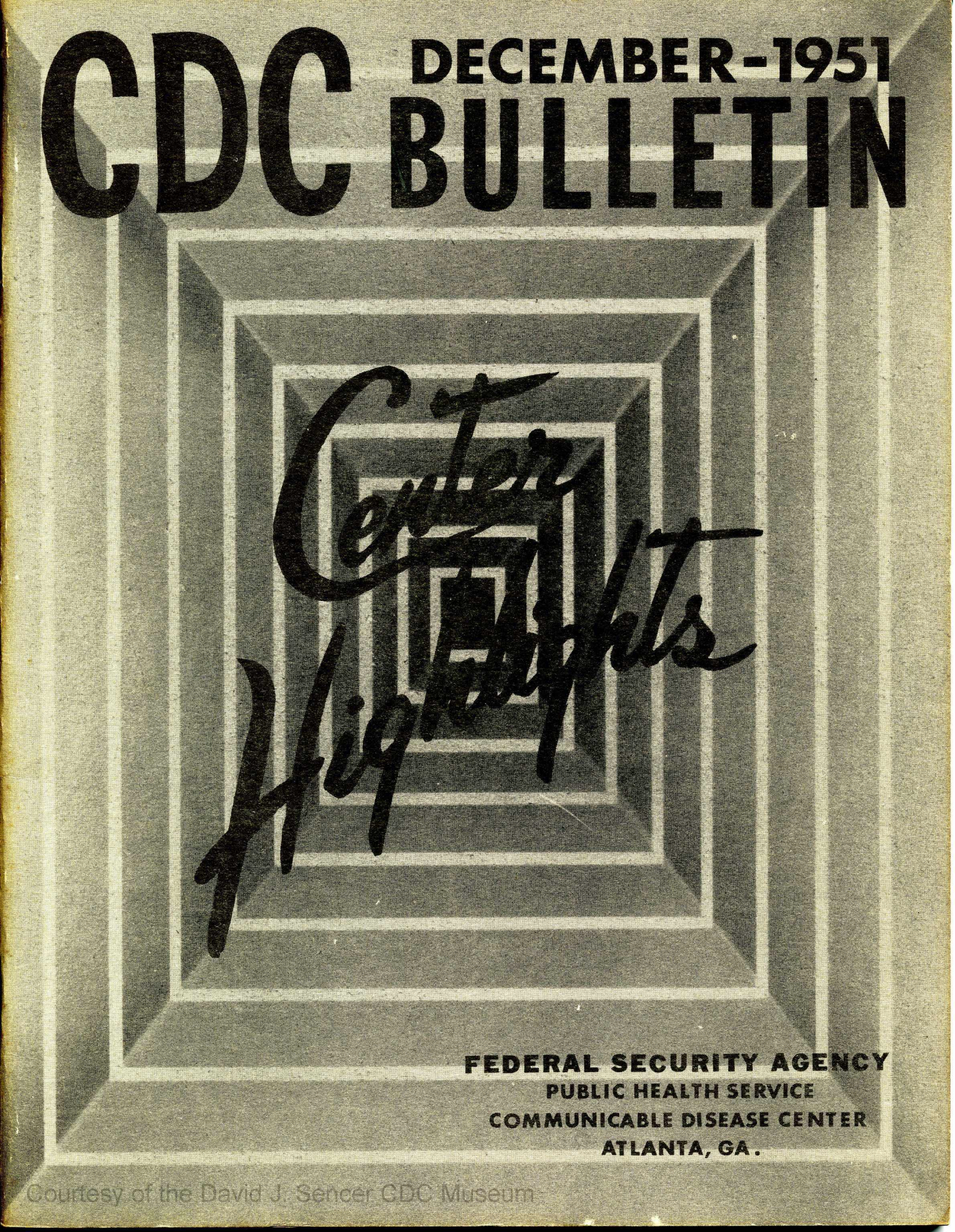
CDC BULLETIN

DECEMBER - 1951



FEDERAL SECURITY AGENCY
PUBLIC HEALTH SERVICE
COMMUNICABLE DISEASE CENTER
ATLANTA, GA.

CDC BULLETIN
Vol. X, No. 12 DECEMBER-1951

CONTENTS

FEDERAL SECURITY AGENCY
Public Health Service
Communicable Disease Center
Atlanta, Georgia

The printing of this publication has been approved by the Director of the Bureau of the Budget, January 19, 1950.

ADMINISTRATIVE BRANCH

PERSONNEL CHANGE

During the early part of the quarter Dr. James B. Sidbury, Jr., S.A. Surgeon (R), was appointed Medical Officer in Charge of the Medical-Dental Clinic.

USE OF GOVERNMENT-OWNED VEHICLES

Authorizations to use Government-owned vehicles between the office and residence expired at the end of the 1951 fiscal year. Instructions for obtaining this authorization to cover fiscal year 1952 were disseminated by Administrative Letter No. 5, June 7, 1951.

THREE ACCOUNTING POINTS INACTIVATED

Effective August 17, 1951, the CDC Accounting points at Little Rock, Ark.; Kansas City, Kans.; and Austin, Tex., were inactivated.

NEW FINANCIAL REPORT

Budget and fiscal activities of several Branches were reviewed and the new financial report "Status of Fiscal Year Funds—By Allocation," was explained in detail. Follow-ups will be made on these reviews to assist personnel in better familiarizing themselves with the new financial report.

CDC PUBLICATIONS AND PRESENTATIONS

A "List of Manuscripts Prepared for Publication and Presentation by CDC Personnel, 1950," was prepared for distribution.

In addition, a supplement for the "List of Manuscripts Prepared for Publication and Presentation by MCWA-CDC Personnel, 1942-1949," was compiled and issued.

SOME CURRENT BOOKS RECENTLY ADDED TO THE LIBRARY

The new fiscal year was begun with over 10,000 volumes cataloged and processed, with many in use. Over 300 volumes were added this quarter including the following:

Advances in genetics, 1950.

American Association for the Advancement of Science. Section on Medical Sciences. Pituitary-adrenal function, 1950.

Austen, E. E.: The house fly, 1950.

Beilstein, F. K.: Beilstein's handbuch der organischen chemie, 1918.

Bright, S. E.: Public relations handbook, 1950.

Brown, A. W. A.: Insect control by chemicals, 1951.

Burn, J. H.: Biological standardization, 1950.

Burnet, F. M.: Production of antibodies; 1949.

Cecil, R. L.: Textbook of medicine, 1951.

Color atlas of pathology, 1950.

Conant, J. B.: Science and common sense, 1951.

Craig, C. F.: Clinical parasitology, 1951.

Davis, D. H.: Earth and man, 1950.

DeSanctis, A. G.: Handbook of pediatric medical emergencies, 1951.

Dublin, L. I.: Length of life; a study of the life table, 1949.

Eads, R. B.: The fleas of Texas, 1950.

Emerson, Haven: Administrative medicine, 1951.

Fink, R. M.: Biological studies with polonium, radium, and plutonium, 1950.

Fuson, R. C.: Advanced organic chemistry, 1950.

Geiger, Rudolf: The climate near the ground, 1950.

Hagan, W. A.: The infectious diseases of domestic animals, 1951.

Hawkins, R. R.: Scientific, medical and technical books 1945-48, supplement, 1950.

Hediger, Heini: Wild animals in captivity, 1950.

Hesse, Richard: Ecological animal geography, 2d ed., 1951.

Hitchcock, A. S.: Manual of grasses of the U. S., 1951.

Hyman, L. H.: The invertebrates, 1951.

Kleinlogel, Adolf: Influences on concrete, 1950.

Klem, M. C.: Industrial health and medical programs, 1951.

Knaysi, G. A.: Elements of bacterial cytology, 1951.

Medical Library Association. Periodicals and Serials Committee: Checklist of the U. S. A. and Canadian holdings ..., 1950.

Metcalf, C. L.: Destructive and useful insects, 1951.

Miller, A. R.: Meat hygiene, 1951.

Morse, M. E.: Microbiology and pathology for nurses, 1951.

Morse, M. E.: Microbiology for nurses, 1951.

Mosher, W. E.: Public personnel administration, 1950.

National Research Council: Laboratory design, 1951.

New York (State) Bureau of epidemiology and communicable disease control: Guide for the handling of communicable diseases, 1950.

Ocean surface waves, 1949.

Pickles, M. M.: Haemolytic disease of the newborn, 1949.

Reed, Charles: Landbirds east of the Rockies, 1951.

Rees, J. R.: Modern practice in psychological medicine, 1949.

Sandell, E. B.: Colorimetric determination of traces of metals, 1950.

Shepard, H. H.: Chemistry and action of insecticides, 1951.

Stephenson, Marjory: Bacterial metabolism, 1949.

Sumner, J. B.: The enzymes, 1950.

Symposium on Brucellosis, Bethesda: Brucellosis, 1950.

Texas Water Works Short School: Manual for water works operators ..., 1951.

Ungerlieder, H. E.: Roentgenology of the heart and great vessels, 1951.

U. S. President's Water Resources Policy Commission: A water policy for the American people, 1950.

Wigglesworth, V. B.: Principles of insect physiology, 1950.

Wilson, C. M.: One half the people – doctors and the crisis of world health, 1949.

Wing, L. A.: Practice of wildlife conservation, 1951.

Wolf, A. V.: The urinary function of the kidney, 1950.

Yule, C. U.: Introduction to the theory of statistics, 1950.

MANUSCRIPTS EDITED, CLEARED

Thirty-seven manuscripts as follows were edited and cleared for presentation and/or publication:

Ajello, Libero: The isolation of *Allescheria boydii* Shear, an etiologic agent of mycetomas, from soil.

Buck, R. W.: The sanitarian and community rehabilitation.

Coleman, R. D.: California mosquito control studies: Cooperative drainage of irrigation lands.

Edwards, P. R.: The serologic typing of enteric bacteria, with particular reference to paracolon bacteria.

Elbel, R. E.: Comparative morphology of some rat flea larvae (Siphonaptera).

Ewing, W. H., Edwards, P. R., and Hucks, M. C.: The thermolable antigens of *Shigella boydii* 2 cultures with special reference to an encapsulated culture.

Ewing, W. H., Hucks, M. C., and Taylor, M. W.: Provisional *Shigella boydii* 9.

Ewing, W. H., and Taylor, M. W.: Two provisional *Shigella boydii* serotypes.

Freeborn, S. B., and Bohart, R. M.: Book Review: The mosquitoes of California.

Furcolow, M. L., Larsh, H. W., Hinton, Agnes, and Cozad, George: The failure of actidione to inhibit the growth of *Histoplasma capsulatum.*

Furcolow, M. L., and Sitterley, Jay: Further studies of geography of histoplasmin sensitivity in Kansas and Missouri.

Georg, L. K.: *Trichophyton megnini* and *Trichophyton gallinae*, nutritional and morphological studies.

Georg, L. K.: *Trichophyton tonsurans* ringworm, a new public health problem.

Gordon, M. A.: A key to the human mycoses.

Gordon, M. A.: Veterinary mycology and its public health significance.

Griffith, M. E.: Additional species of mosquitoes in Oklahoma.

Hayes, W. J., Jr., and Gaines, T. B.: Laboratory studies of warfarin and related rodenticides.

Hutson, G. A., Howitt, B. F., and Cockburn, T. A.: Encephalitis in the Midwest. VIII. Neutralizing antibodies in the sera of small wild mammals. Colorado 1950.

Johnson, R. J., and Buck, R. W.: Housing programs and the health department.

Kartman, L.: Ten problems of interest to parasitology students in Hawaii.

Link, V. B.: Plague in the United States of America.

Link, V. B.: Plague on the high seas.

Owings, R. H., and Mandel, E. E.: Studies in nonprotein nitrogen. I. A convenient method for measuring urea in blood.

Rubin, Harry, Kissling, R. W., and Chamberlain, R. W.: Isolation of a psittacosis-like agent from the blood of snowy egrets.

Simmons, S. W.: The expert committee on insecticides of the World Health Organization.

Simmons, S. W.: Toxicological problems involved in the use of insecticides.

Sommermeyer, L. M.: Laboratory studies on nursing procedures, an essential function of the nursing profession.

Steele, J. H.: Canine diseases of public health importance.

Steele, J. H.: Health of animals in relation to human health.

Steele, J. H.: Veterinary medical activities of the U. S. Public Health Service.

Steele, J. H.: Veterinary public health education.

Stenburg, R. L., Tarzwell, C. M., Nicholson, H. P., and Lynn, W. D.: The resistance of construction materials to penetration by rats.

Sumerford, W. T., Fay, R. W., Goette, M. B., and Allred, A. M.: Promising DDT-synergist combinations for the control of resistant flies.

Tisdale, E. S.: A national program for training public health personnel.

Vonderlehr, R. A.: Photography in public health.

Willis, M. J., and Sunderman, F. W.: Studies in serum electrolytes. Nomograms for calculating magnesium ion concentration in blood sera.

Wilson, F. J., Kalish, Catherine, Fish, C. H., and Patnode, R. A.: Use of oxidation-reduction dyes in the determination of virulence of mycobacteria *in vitro*.

AUDIO-VISUAL PRODUCTION BRANCH

MAJOR PRODUCTIONS RELEASED DURING THE QUARTER

Motion Pictures

M7 Public Health Aspects of Milk. 16 mm., sound, black and white, 11½ minutes, 414 ft.

M51a Laboratory Control for Milk Sanitation. 16 mm., sound, black and white, 9 minutes, 315 ft.

M57a Infectious Hazards of Bacteriological Techniques, Part I – The Inoculating Needle. 16 mm., sound, black and white, 10 minutes, 346 ft. (For Biological Department, Army Chemical Corps, Camp Detrick, Md.)

Filmstrips

F80 Community Fly Control Series, Biology of Domestic Flies. 35 mm., sound, color, 9½ minutes, 82 frames.

F98 New Technique for Rearing Blood-Sucking Insects. 35 mm., silent, black and white, 31 frames.

MAJOR PRODUCTIONS COMPLETED AND AWAITING RELEASE AT END OF THE QUARTER

Motion Pictures

M92 The Field Representative.

M93 The Receptionist.

Filmstrips

F86 Development of Job Information.

Exhibits

E89 Veterinary Public Health at Work.

AUDIO-VISUAL HEALTH MISSION TO SOUTH EAST ASIA

Mr. Gale C. Griswold, Chief, Audio-Visual Production Branch, left on July 22 on an audio-visual mission to South East Asia to survey local health problems, and to determine what audio-visual media will best assist in their solution. This is a cooperative project of the State Department, the Division of International Health, and the Economic Cooperation Administration. He stopped first in Paris where he visited Dr. Charles Toumanoff at Pasteur Institute and had a conference with Dr. John B. Grant, Director of the Rockefeller Foundation in Europe. He also consulted with Dr. Brock Chisholm, Dr. Sutre, and other officials of the World Health Organization in Geneva concerning audio-visual problems and needs in South East Asia. In Rome he visited Dr. Paul F. Russell, Chief of the Rockefeller Foundation Program in that area.

In Burma, he was joined by Dr. Paul S. Henshaw, and they made extensive visits in

Burma, Thailand, and Indo-China before the ECA representative joined them in the Philippines. They first spent several days in Burma and then flew to Bangkok, Thailand, where they attended the conference of South East Asia Special Technical and Economic Mission (STEM), ECA, personnel, August 6-11. This conference provided an excellent orientation and partial study of the use of audio-visual materials in these programs. From there they also traveled by plane and jeep into north Thailand in the Chiengmai area to observe actual operations of STEM's malaria control programs. The next stop was Saigon, Indo-China, where approximately 2 weeks were spent in conference with STEM and local health officials and in visits to various areas in which health programs were in operation.

In the Philippines, the ECA representatives joined the group. Three weeks were spent in observing local health conditions and in obtaining background information and research material for the development of the treatment and story boards for the animated film on "Round Worm Infestation in Children." Several conferences were held with representatives of STEM and officials of the Philippine Health Department in developing a suitable treatment for the film. Before the Mission left the Philippines, this treatment had been revised and approved by all parties directly concerned.

SOCIAL SECURITY ADMINISTRATION FILMS

Work was in progress during the quarter on three motion pictures for the Social Security Administration, Old Age and Survivors Insurance Branch, Baltimore, Md. Editing, sound recording, and processing of final release prints will be done for the following films: "The Claims Supervisor," "The Field Representative," and "The Receptionist."

"FLUOROSCOPY OF THE HEART" FILM

Two films on "Fluoroscopy of the Heart" are to be made in cooperation with Emory and Grady Hospitals, Atlanta, Ga. The first film will show the functioning of the normal heart through photofluoroscopy, and the second, functioning of the diseased heart. Photography is being done at Grady Hospital. The continuity will be developed and the editing, processing, and sound recording will be done by CDC.

MOSQUITO PREVENTION FILM

A tentative script was prepared on "Mosquito Prevention in Irrigated Areas." A camera crew was sent to the CDC Field Station at Mitchell, Nebr., on September 6 to begin shooting on these productions.

"CHICK EMBRYO TECHNIQUES" FILM

At the International Scientific Film Association Congress, held at the Hague, a CDC production, "Chick Embryo Techniques," was a feature on the special program for international scientists and an assembly for physicians and medical students from Leyden, Utrecht, and Amsterdam.

KANSAS CITY FLOOD

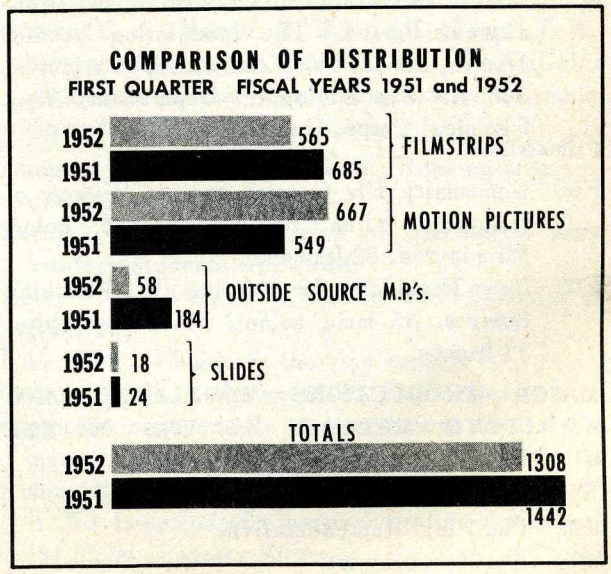
Three cameramen went to the Kansas City flood area to obtain motion picture footage of the health problems accompanying and following the flood disaster, and the methods used in combating these problems. Photographs were made of the conditions left by the receding waters; disposal of animal carcasses into sanitary landfills; mixing, distribution, and placing of rat bait and checking the resulting kill; and power and hand spraying. This footage will be used in production of training aids needed for flood disaster.

UTILIZATION PROGRAM

Chart 1 shows a distribution of 1,308 titles by the film library for the quarter. Confirmation has been received that 319 prints of CDC motion pictures have been purchased from United World Films.

Supplements Nos. 1a and 1b to the CDC film catalogs and a revised 2-page list of motion

Chart 1



pictures and filmstrips for sale were mailed to each of the approximately 2,500 holders of CDC catalogs.

Production of New Utilization Materials. A four-page mimeographed "Criteria for Selection of Films for Training Purposes" was released for use by all Branches of CDC.

Utilization and Evaluation. During the quarter, field evaluation report cards were received, giving 347 ratings for motion pictures and 85 for filmstrips. The ratings were distributed as shown in table 1.

Table 1

FIELD EVALUATION OF MOTION PICTURES AND FILMSTRIPS

Type of Ratings Received	Number of Ratings		
	Motion Pictures	Filmstrips	Total
Excellent	186	51	237
Very Good	89	19	108
Good	60	8	68
Fair	8	5	13
Poor	4	2	6
Total	**347**	**85**	**432**
Letter Average	VG	VG	VG

ENGINEERING BRANCH

TRANSFER OF PERSONNEL

Senior Sanitary Engineer John S. Wiley replaced Senior Sanitary Engineer (R) John H. Bright as Assistant Chief of the Branch in August. Mr. Bright entered Columbia University in September for a year's academic training, and Mr. Wiley was transferred to his new position from the Environmental Health Center, Cincinnati. Sanitary Engineer (R) William B. Schreeder, the CDC vector control specialist in Region I, also left for a year's academic training and will be replaced in December by Sanitary Engineer Director Frank R. Shaw. Sanitarian (R) William A. Hendrix was assigned as regional CDC vector control specialist to Region VIII, Dallas, Tex., in September.

WATER RESOURCES DEVELOPMENT

The Water Development Section was added to the Branch. The new Section includes the functions of the Impounded Water Section and the irrigation-encephalitis and basin activities formerly centered in the Office of the Chief and part of the Encephalitis Surveys Section of the former Office of Midwestern CDC Services. The Section will direct and coordinate CDC activities in the investigation and control of insects of public health importance associated with water development projects throughout the United States.

U. S. Fish and Wildlife Projects. Detailed reviews were made of the reports of the Fish and Wildlife Service on the Cumberland River in Tennessee and on the Old Hickory Reservoir Project in Tennessee. The Communicable Disease Center, with the concurrence of the Tennessee Department of Public Health, prepared recommendations proposing certain changes in the reports which will reduce the mosquito potential and decrease the possibility of mosquito-borne disease transmission on these projects.

River Basins. In August, a report on "Mosquito Producing Aspects of the Weber Basin Project West of the Wasatch Front in Utah" was submitted to the Bureau of Reclamation. The report contained the results of a survey conducted jointly by the Center and Region IV of the Bureau of Reclamation. Active participation in the Weber Basin study was concluded in September.

MALARIA CONTROL ACTIVITIES

Practically all CDC field personnel on the Malaria Eradication Program were discontinued during the last quarter of fiscal year 1951. Con-

sequently, spray operations were conducted almost exclusively with local funds for both personal services and insecticides this season.

Spray operations were in progress in all States during July, in 12 States during August, and in 8 States during September. According to accomplishment data taken from State monthly reports, 84,837 spray applications were made to interiors of residences or to premises outbuildings. These activities utilized a total of 47,344 lb. of DDT, 6,403 lb. of chlordan, and 358 lb. of lindane.

All States were encouraged to assign State personnel to surveillance "teams" of entomological, epidemiological, and engineering personnel.

Special Studies. The States of Alabama, Arkansas, Georgia, Mississippi, South Carolina, and Texas continued a special study of shut-off valve performance which was begun in the spring of 1951. Reports on the results of these tests had not been received from three States at the end of the quarter.

TYPHUS AND RODENT CONTROL

Murine Typhus. The number of reported human cases of murine typhus fever continued to decline. Official totals for the period April through June 1951 show 94 reported cases of murine typhus fever, as compared to 172 cases for the same period in 1950.

The rat blood sampling and surveys are being continued by the States in an endeavor to locate, delineate, and eradicate the remaining foci of infection. During July and August blood samples were obtained from 1,168 premises in 9 States. Three hundred and eighty were taken in Alabama, and 318 in Texas. The remainder were taken in other States.

The widespread use of warfarin throughout the rural areas of Florida, Georgia, and Alabama has reduced the rat populations to such an extent that it is becoming difficult for the biological survey teams to secure rats for testing. In Georgia, county officials are providing, under various plans, permanent bait stations and mixed bait. Thousands of these stations are now in use.

State and local agencies contributed 76 percent of the total man-hours in the typhus control States. Ten meetings were held with a total of 218 in attendance. Eight sanitarians spent an average of 18 hours each in on-the-job training in domestic rodent control (tables 1 and 2).

City Rodent Control Activities. The activities of rodent control specialists in the 20 States participating in cooperative city rodent control consisted of survey work, antirat sanitation, training, promotion, conferences, and poisoning. State and local agencies contributed 82 percent of the total man-hours. Ninety meetings were held with 3,943 in attendance, and 221 sanitarians and others received an average of 15 hours each in on-the-job training (tables 1 and 2).

Norfolk, Va., and Albuquerque, N. Mex., continued their ratproofing programs, and 189 establishments were ratproofed.

Defense-connected Activities. At the request of the Commanding Officer, an inspection was made of the U. S. Coast Guard Base and Training Station at Alameda, Calif. Recommendations were furnished concerning antirat sanitation measures that should be instituted.

Four armories in the State of Maine were inspected, and appropriate officials were advised of findings and recommendations to prevent or reduce rat infestation.

FLY CONTROL ACTIVITIES

In connection with the educational-informational phase of headquarters activities, more than 100 Fly Control Packets were distributed. Since the initial distribution, requests for the packets have come from 31 States and several foreign countries. Also in keeping with the educational program, the Fly Control Exhibit, previously displayed at the Federal Security Agency Building in Washington, was shown at the Interstate Sanitation Seminar at Charlottesville, Va. Showings were scheduled for the fall CDC meeting and for Phoenix, Ariz.

Information on vegetable and fruit waste disposal is being compiled in the anticipation that this will lead to improved disposal methods, especially at Phoenix, Ariz., and in other cities in the southwestern States.

Polio-Fly Control Projects. A high degree of fly control continued in Charleston, W. Va., through July and August with a consequent release of personnel to carry on a simultaneous "red tagging" drive to improve refuse storage. In the sanitation drive, 1,809 red tags were distributed and, up to the time of this report, 1,490 householders had complied with the request for adequate containers. Nearly all of South Charleston was covered in this drive.

A detailed report of a study of Charleston's refuse handling practices was presented to city officials and already one of the recommendations of the report has been acted upon – regular refuse

Table 1

TIME AND PERCENTAGE OF WORK DEVOTED TO MURINE TYPHUS AND RODENT CONTROL
July 1 to August 31, 1951

	Murine Typhus Control		Rodent Control	
	Man-hours	Percentage of Total Time	Man-hours	Percentage of Total Time
State and Local	49,318	76	43,074	82
Public Health Service	15,498	24	9,587	18
Total	64,816	100	52,661	100
	Percentage of Total Time		**Percentage of Total Time**	
State and District Supervision, Shop and Entomological Service (PHS)	13		3	
State and District Supervision (State and Local)	8		2	
Antirat Sanitation Activities	5		24	
Residual DDT Dusting	18		2	
Evaluation Activities	14		29	
Ratproofing and Initial Eradication	13		3	
Maintenance of Ratproofing	2		1	
Rat Poisoning and Gassing Operations	26		11	
Surveys	0		2	
Training and Educational Activities	0		21	
Miscellaneous and Leave	1		2	
Total	100		100	

Table 2

TYPHUS AND RODENT CONTROL ACTIVITIES
July 1 to August 31, 1951

	Murine Typhus Control	Rodent Control
Number of Meetings	10	90
Number in Attendance	218	3,943
Number Persons On-the-job Training	8	221
Average Man-hours per Trainee	18	15
Cities with Ratproofing Projects	10	2
Establishments Ratproofed	234	189
Counties with Poisoning Projects	66	19
Establishments Poisoned	28,979	3,061

collection has been extended to a section of the city previously without this service.

During September the suspected development of dieldrin resistance in flies in Charleston was confirmed. Although a high degree of fly control in July and August was made possible by spraying trouble spots with dieldrin, the resistance manifested itself to the extent that DDT space spraying was necessitated in September.

At Phoenix, Ariz., project personnel are now directing and intensifying their effort toward the elimination of special problems. For instance,

arrangements have been made for satisfactory clean-up and disposal of manure from a large racing stable, and a number of business establishments and housing projects now provide adequate refuse storage for the first time. In addition, the city has planned for weekly trash pick-up during fiscal year 1952.

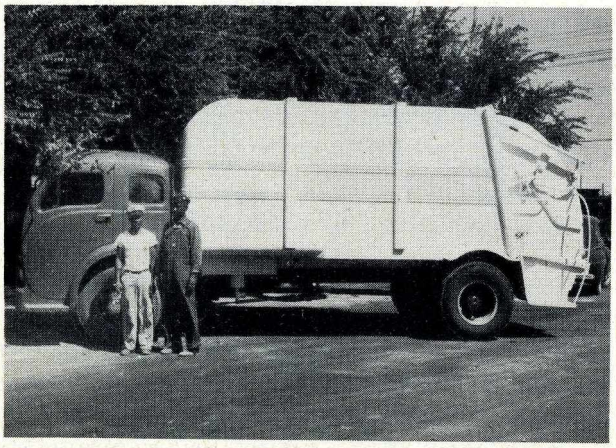
Early in the quarter, indiscriminate cantaloupe cull dumping, and unusual rains turning dry media into active breeding sources raised grill counts considerably, but an extreme rise was thwarted.

Space spraying with DDT-DMC combination continued to be effective. Several pyrethrin formulas were tested with promising, although inconclusive, results. Dilan, as a residual, proved effective at a few test sites, but the possibility of its widespread use is restricted by its high cost.

Dysentery and Diarrhea Fly Control Programs. Although CDC operations were suspended at the Yuma, Ariz., and Coolidge, Ariz., projects, these communities hope to continue a limited fly control program. The many improvements these cities have made in the past year should enable them to proceed from this intermediate point quite effectively.

At Casa Grande, Ariz., a satisfactory degree of fly control was maintained and sanitation improvements were continued. Night fogging using DDT remained effective.

At Carlsbad, N. Mex., several hundred sanitation calls have been made, with garbage wrapping and adequate storage being requested. The city recently put into service a 20 cu. yd., packer-type, collection vehicle, and the initiation of a city-wide, twice-a-week collection is anticipated.



A 20 cu. yd. packer-type collection vehicle.

Twice-a-week refuse collection from residences and business establishments resulted when the city of Sinton, Tex., put two new packer-type, collection vehicles into operation. In keeping with other sanitation improvements, a bond issue was approved for water main extensions, additional sewerage, and a new sewage treatment plant.

In another Texas project city (Taft), a garbage can drive and privy elimination program resulted in many improvements. Bids are being solicited for additional sewer lines.

The sanitary landfill at Seguin continues to operate efficiently, and city officials claim a great saving by substituting the landfill for a proposed incinerator. Civic groups in this city are presently participating in several phases of the sanitation program.

In addition to the locally sponsored fly control programs instituted during the fourth quarter fiscal year 1951 in Atlanta, Olney, and San Marcos, Tex., similar programs were begun at Bastrop, DeKalb, Aransas Pass, and Gregory. The Texas State Department of Health indicates that the success of the initial fly control projects led to the establishment of locally financed projects. Special fly control activities, instituted at the time of the dysentery-diarrhea and polio outbreak at Corpus Christi, resulted in a permanent fly control project in that city.

The fly control school operated by the Texas State Department of Health continued to gain the praise of municipalities sending representatives. During July and August alone, 61 cities sent 149 "students." Since the course has proved so successful, it is now scheduled for a number of different cities, so that representatives can attend with the least amount of inconveniences.

The survey of refuse collection and disposal practices in Harlan, Ky., is nearly complete. It is hoped that this study will enable the city to improve refuse handling operations without additional cost. After becoming aware of the improvements made in Harlan, the nearby town of Hazard, Ky., instituted a fly control program incorporating many of the Harlan procedures.

DISASTER AID

A detailed, comprehensive report of CDC participation in the recent midwestern flood has been prepared by Sanitary Engineer Director Frank R. Shaw and appears on page 47 of this Bulletin. By the end of the quarter only two Engineering Branch personnel continued on detail in the flood area.

ENTOMOLOGY BRANCH

INSECT SURVEYS MANUAL

A Manual of Operations for River Basin Public Health Insect Surveys, which was prepared as a guide toward obtaining the over-all objectives of River Basin Surveys in a more or less uniform and coordinated manner, was submitted to several of the field projects for review. The majority of the reports received have been quite favorable. In the surveys, an effort is made to concentrate on disease vectors and pests directly related to water and water use.

MALARIA INVESTIGATIONS

Routine and special investigations of malariometry were continued at the three Malaria Investigations Stations so as to maintain current evaluations of conditions associated with malaria, and to explore basic relations involved in perpetuation of infections. No blood-positive malaria cases were detected in any of the intensive study areas, or among persons included in more extensive periodic surveys. Approximately 4,000 blood examinations were made of residents in areas where malaria was formerly highly endemic.

Drastic reductions in anophelism occurred in the Georgia and Arkansas areas, while station counts of *Anopheles quadrimaculatus* during the quarter in the South Carolina area were twice as high as for the same period of the previous year.

Activities included: (1) further exploration of factors involved in limiting *Anopheles* abundance; (2) studies on survival and infectivity of malaria parasites under various conditions; and (3) investigation of conditions that influence susceptibility of mosquitoes to malaria.

MANNING, S.C., STATION

Epidemiological Activities. Blood films were collected each month from approximately 1,700 of the 1,900 persons residing in the intensive study area. The semiannual survey of the population in marginal sectors was made during September. Of the 1,110 inhabitants in this area, 87.5 percent were checked. No malaria-positive blood smears were reported from these surveys.

Biological Activities. Based on weekly counts of adult female anophelines at 33 stations, total numbers were comparatively low. However, *A. quadrimaculatus* was twice as numerous as last year. *Anopheles crucians* counts were only one-third as high as they were at the same time in 1950. Mosquito breeding, in general, continued to be limited by the extended drought.

A total of 5,041 *Anopheles* – 720 *crucians* and 4,321 *quadrimaculatus* – were dissected for salivary gland examination. One *crucians* and three *quadrimaculatus* were detected with unidentified sporozoites in the salivary glands. Suspensions of these sporozoites in citrated blood were inoculated into canaries and a sparrow, with negative results. No positive information has been obtained that suggests the source of these sporozoite infections in anophelines.

Studies on sporozoites of known origin were facilitated by using *Culex quinquefasciatus* mosquitoes from the laboratory colony. Infective females were obtained after they had blood meals from canaries or sparrows harboring *Plasmodium relictum* parasites.

Recent investigations disclosed an uncertainty regarding the effect of refrigeration on the infectiveness of sporozoites in the salivary glands of *C. quinquefasciatus.* This led to the cessation of the practice followed in this laboratory of storing wild-caught anophelines in the refrigerator. It was found that these mosquitoes could be kept satisfactorily at room temperature with damp towels wrapped around the collecting cartons; not more than 3 days are allowed to elapse between the time of collection and the actual dissection of the specimens.

Blood film examinations of domestic chickens, primarily those hatched this year, were continued at three stations in the study area where anophelines are collected. Of 152 fowl observed, 122 were young, and 30 were mature. A total of 19 older fowl was positive for the blood parasite *Leucocytozoon andrewsi*, while 1 young bird was found infected. Cases with appreciable numbers of the parasite in the blood have not been noted, especially in the very few infected, immature chickens thus far located. For this and other reasons, investigations of possible vectors carrying

sporozoites have been delayed. Routine observations of blood samples from certain parasitized fowls, made at frequent intervals for more than a year, have revealed practically no change in the character of the *Leucocytozoon* infections.

HELENA, ARK., STATION

Epidemiological Activities. In preparation for termination of station activities, routine house-to-house visits by the nurse were discontinued. Blood surveys of Negro school children were made in Dyer and Lake Counties, Tenn., and in Tensas and Madison Parishes, La. Approximately 900 blood films were collected, all of which were negative for malaria parasites. These areas were formerly highly malarious, but, in general, health authorities now consider malaria incidence to be very low, if extant at all. This opinion was confirmed by a few of the local physicians, but many of them thought malaria to be present, and a few considered it to be on the increase. In no instance could positive blood films be produced to support claims of malaria prevalence.

Biological Activity. A great reduction in *Anopheles* was observed in both rice-field and delta areas. *Anopheles* larval counts dropped from 11.2 per dip in the preceding quarter, to 0.4 per dip during the present period. In the rice field the drop was from 27.1 to 3.9 larvae per dip during the same period. Observations suggest that extensive insecticidal dusting in cotton fields was the primary cause of the decline in both larval and adult anophelines.

Investigations indicated that eggs of a domesticated strain of *A. quadrimaculatus* did not survive desiccation on rice field soil as well as did eggs from rice-field and delta strains of this species. Eggs from the domesticated strain succumbed between 120 and 144 hours, whereas some eggs of the other strains hatched after 168 hours of desiccation.

Tests were made at the National Institutes of Health laboratory in Columbia, S. C., on the comparative susceptibility of *A. quadrimaculatus* strains from delta and rice-field areas, as well as a colonized strain, to human malaria. The results of these experiments suggest that there are significant differences in susceptibility of these mosquitoes to human malaria.

NEWTON, GA., STATION

Epidemiological Activity. During the course of regular visits to residents of the experimental area, 19 persons were found who exhibited symptoms of malaria. In no instance, however, was the suspicion confirmed by blood examination.

Biological Activity. The persistence of drought conditions has caused the virtual disappearance of *Anopheles*. Most of the usual breeding places were dry, and only 17 adult *Anopheles* were located in routine collecting stations.

Continued unsuccessful attempts were made to colonize local *A. quadrimaculatus*. Approximately 12,000 adult mosquitoes, reared from ova obtained from wild-caught specimens, were placed in the large outdoor cage (10 ft. by 10 ft. by 15 ft.). In only one instance were viable ova secured from mosquitoes in the cage.

Studies on the effect of temperature on *Anopheles* larval development were advanced. Analyses of ova and larval mortality, at different temperatures between 55° F. and 90° F., indicate that there was no significant difference in embryo mortality. Mortality of larvae was generally high; 30 percent died at 70°, but survival was consistent under each experimental condition throughout the developmental period. More larvae survived at 70° than at any other temperature used in the experiments.

The significance of production of different types of eggs by the same species of *Anopheles* is not well known. Various kinds of ova have usually been classified as "summer" and "winter" types. In an attempt to determine the effect of temperature in inducing one type or the other, wild-caught female *Anopheles* were collected and held at different temperatures until they oviposited. Considerable variation was encountered that may be attributed to the fact that the adult mosquitoes were obtained during the transitional period between summer and fall. Further observation of specimens collected at well-defined seasons may supply more definite information.

It is known that extreme temperatures are lethal to *Anopheles* adults, but the effect of periodic occurrence of high temperatures on limiting longevity is not established. Experiments designed to develop techniques for such an investigation were conducted using *C. quinquefasciatus*. It was found that only when exposed for 3 hours to temperatures above 100° F. was mortality appreciable. Subsequent studies will employ *Anopheles*.

Investigation of factors influencing susceptibility of mosquitoes to malaria parasites, and infectivity of parasites to mosquitoes, was continued. Two species of avian malaria, *Plasmodium cathemerium* and *P. relictum*, were induced

into ducks, which are aberrant hosts. It was found that infectivity of parasites was reduced. Only 8 percent to 36 percent of mosquitoes became infected, whereas 91 percent were infected if the parasites developed in a natural host.

ENCEPHALITIS INVESTIGATIONS – CALIFORNIA*

Incidence of Encephalitis in Man and Horse Between the last week in June, and October 3, 1951, the Kern County Health Department reported nine human cases of encephalitis. Three additional cases are known to have occurred during this period. As yet, only four of these cases have been confirmed by laboratory tests, one Western equine, and three St. Louis. Including the first week in September, 11 cases in horses were reported by local veterinarians, but none of these has been confirmed by laboratory tests.

Entomological Studies. Collections of mosquitoes for virus tests were continued, and over 17,000 *Culex tarsalis* were collected from various study stations, identified, and frozen for future virus tests. In addition to these, some 6,100 *C. quinquefasciatus*, collected from the same stations, were frozen. In preparing the *tarsalis* for laboratory tests, pools of 25 and 50 mosquitoes were made up in order to simplify preparation of variable-sized pools at the virus laboratory.

Continuing the biological studies on mosquitoes, the attractiveness of carbon dioxide to mosquitoes was again tested: mosquito traps were constructed from standard 15-lb. lard cans for use with the dry ice bait; these have the advantage of being much more portable than the stable traps, and have been tested under a variety of conditions. In an area where the population of *C. tarsalis* is extremely large, the lard can units have proved satisfactory, a single trap catching as many as 250 mosquitoes in 1 night.

With the purpose in mind of obtaining data on adult population trends in standard stations distributed within the three study areas, and to attempt to correlate these trends with the larval populations in the vicinity, with the climatic conditions, and with the amount of virus infection in the mosquitoes, a study of *Culex* populations was started. A series of the usual standard type artificial resting places, boxes painted red on the inside, were placed in various situations which appeared to afford optimal situations for mosquito resting, and weekly counts and collections were made in these boxes. In addition, other stations such as tree holes and wall areas were established, from which weekly collections were made. As a corollary to the adult counts in established stations, monthly estimates of larval densities were made in breeding areas adjacent to the adult stations. It will be some time before results of this study can be finally completed.

Laboratory Experiments on Mosquito Transmission. A number of laboratory experiments on various aspects of mosquito transmission of encephalitis virus have been, or are being, performed at the virus laboratory, but results for most of these tests are not yet available. Sample subtitles of these laboratory experiments are the two following, which illustrate investigations being conducted: (1) study of titer of Western equine encephalomyelitis virus (strain F 199) required to infect *C. tarsalis;* (2) length of time during which a chicken can serve as a source of Western equine encephalomyelitis virus for the mosquito *C. tarsalis.*

Acarological Studies. Difficulties have been encountered in successful colonization of *Fonsecaonyssus* (= *Liponyssus*) *sylviarum* due to contamination of mite units with tyroglyphid mites. Modification of sterilization methods, as well as repeated serial sub-colonization, have been resorted to in an attempt to decontaminate the colonies, and at the present time, it appears that the methods used have resulted in some colonies being free of these tyroglyphids.

In the avian surveys, serum samples and blood smears were taken from wild birds captured in two of the study areas. During the summer of 1951 in the Kern County area, a total of 100 adult birds, 79 immature birds, and 55 fledgling birds were sampled, for an over-all total of 234 specimens. These 234 serum samples are to be tested for the presence of antibodies against the encephalitis viruses. Also, an equal number of blood smears were made from the same birds, to be examined for the presence of blood parasites.

SURVEY AND EVALUATION, RESIDUAL SPRAY

Entomological inspection reports for the 1951 operational season of the Residual Spray Program continue to be received. The data received up to the time of this report indicate that a single residual application of DDT inside houses is still effective in the control of *A. quadrimaculatus* throughout the entire breeding season, and that there is no indication of the development of

*Contents of this Encephalitis report should not be considered as published, nor should reference be made to it in other publications, without permission.

DDT resistance by this mosquito.

The data relative to the incidental fly control accomplished by the Residual Spray Program were summarized for the period 1948-1950. These summaries indicated that sprayed houses had significantly fewer flies than unsprayed houses. Figure 1 indicates the high densities found in calendar year 1950.

An analysis of data obtained in calendar year 1950 from premises investigation, and wall and panel testing procedures made in connection with unsatisfactory fly control in DDT-treated houses, revealed that DDT resistance of flies was of minor importance as a factor contributing to poor fly control results. Tests made with locally caught flies on special panels of known DDT residual deposit indicated that only 15.5 percent of the premises investigated had fly populations significantly resistant to DDT (figure 2). In the remaining 84.5 percent of the fly populations tested, it was found that DDT residual application to walls, as practiced in the Residual Spray Program, was capable of killing exposed flies in varying degrees, but because of large replacement fly populations resulting from general unsanitary conditions, it was not capable of giving satisfactory fly control.

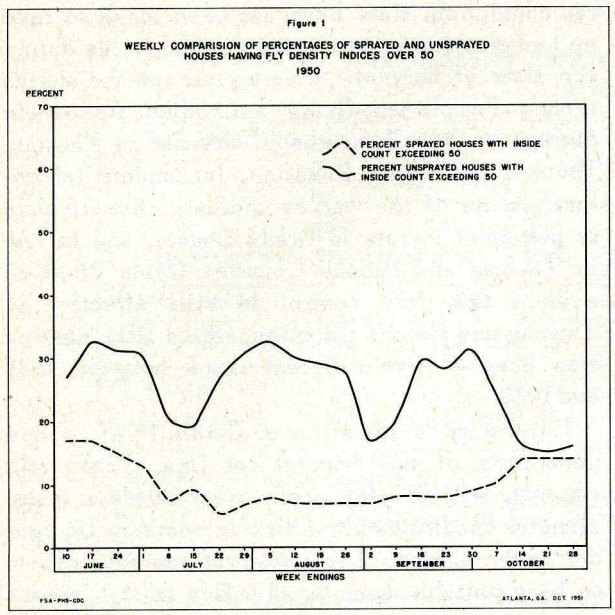
THOMASVILLE, GA., STATION

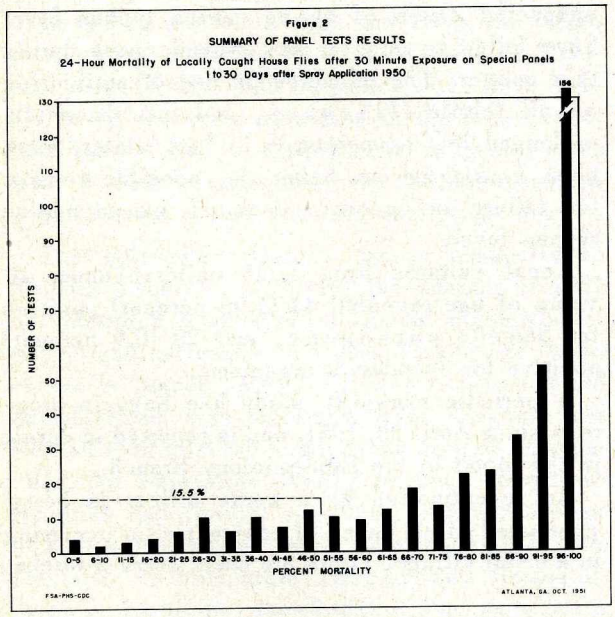
Field work was relatively unhampered by adverse weather conditions. Although the season was considered to be abnormally dry, there was more precipitation occurring at more favorable intervals than during the comparable period last year. The drought conditions this year, following as they did a previous year of deficient rainfall, were generally reflected in a lowered water table and some crop failures, but not in materially reduced arthropod prevalence. Exposed residual spray deposits were flushed by more frequent rains than last year, a fact that did not help their already-diminished effectiveness (due to house fly resistance) to the more widely used insecticides. Natural phenomena of particular interest were the much shortened effective period of insecticides which previously had been unused in the study areas, and the disappearance of a previously abundant fly species.

Dysentery Studies. The rapid acquisition of resistance to residual-type insecticides by house flies (*Musca domestica* Linn.) throughout this area indicated a need for fundamental changes in the usage of these residual insecticides. In the absence of comprehensive data with regard to the genetics of such resistance, it appeared probable that the immunity to insecticides was due to selection of normally recessive factors by the insecticides used. An experiment was begun in June 1951, designed to test the effect of the dilution of selected populations with normal (or nonselected) populations. The success of the experiment depended upon a previously undetermined factor of fly distribution. Only the major breeding foci were sprayed, in the hope that theoretically normal flies from smaller untreated breeding foci, and with dominant factors for insecticide susceptibility, would interbreed with flies "selected" for resistance, and would result in the dilution of the resistance factors. It was hoped that such dilution would be effective for an indefinite period, or at least for a significantly greater time than was required to select resistant populations when all surfaces were sprayed, and when no possibility of normal flies existed.

Two towns received such spot treatment with insecticides. Spot spraying in one town was supplemented by prophylactic sanitation in these same breeding foci, while the second town was dependent for control purposes entirely upon the insecticide; a third town was subjected to an insecticidal spraying of all surfaces suitable for residual treatment. Although the acquisition of a high degree of resistance to dieldrin in the house fly populations of towns 1 and 2 required approximately twice the period of time taken in town 3, there was little difference in practical effect. Towns 1 and 2 "selected" highly resistant populations in 6 to 8 weeks, as compared to 3 weeks in town 3. Factors accounting for the rapid selection for resistance in 1951 have not been determined, but may hinge upon a rapid interchange of fly populations, and few, if any, totally susceptible house flies remaining in the area.

Simultaneously with the chemical insecticide studies, a study of the effects and costs of certain basic sanitation features was begun. One town was subjected to weekly cleaning of barns, which constituted the major production source of house flies. The results were excellent throughout the summer, although the results of similar activities in a nearby town were not as successful, primarily due to fly migration from peripheral, uncleaned barns and animal enclosures. The cost aspects, coupled with the good fly control achieved, indicate that such prophylactic sanitation holds the most promise in rural fly control.





To further check on the effectiveness of sanitational methods of fly control, all work was discontinued in the first-mentioned town after September 6, and at the same time work was intensified in town number 2 so as to include the sanitation of peripheral barns.

An interesting laboratory study to determine the rapidity of selection for insecticide resistance in the house fly populations of several towns was carried on. Of greatest significance was the confirmation of field observations that, once maximum dieldrin resistance was attained, this insecticide continued to be ineffectual.

The total disappearance of the excrement-breeding fly (*Sarcophagula occidua*) during the current year has been most unusual, and is attributed to the extremely cold weather of the past winter. This species, when found in this area, is approaching its northern distribution limit. Other fly-breeding material studies were continued to increase the knowledge of breeding habits so as to assist in sanitation or other environmental alteration efforts.

Environmental sanitation work in Thomasville was continued, and a very encouraging popular response was encountered. A continuation of this trend will insure cooperation of city officials. This program is augmented by a school education series (CDC films for the most part), that has been very well received. Industrial sanitation work is continuing, with emphasis upon the economy of such operations in order to encourage voluntary cooperation of industries. Studies to determine feasibility of fly exclusion from privies have been intensified, due to the difficulties in fly control caused by house fly resistance to insecticides.

Eye Gnat Conjunctivitis Studies. Routine determinations of gnat abundance were made in one town in conjunction with the investigation of clinical cases of sore eyes. Also, 12 gnat traps have been operated weekly in another town to obtain data on the frequency and intensity necessary for trapping to give a satisfactory index of gnat prevalence. This study was concluded at the end of 26 consecutive days, with a total of 1,560 collections.

Further study was made of the factors affecting the operation of traps over longer periods of time, and the use of dieldrin to prevent the escape of trapped gnats was subjected to preliminary tests.

Studies on the flight of gnats in relation to attractants and wind velocities were undertaken in a large barren area, with 25 traps set in five rows, in an 80-ft. square. In three tests, at wind speeds usually less than 5 miles per hour, an appreciably greater number of gnats was caught in the traps on the side of the square toward which the wind was blowing.

Preliminary tests of fluorescent dyes to mark adult gnats for later recognition indicated that when mixed with gum arabic and sprayed on the insects, these dyes would not last a sufficient period of time. When dyes were mixed with food,

they failed to color tissues outside the digestive tract, and could only be seen when the crushed insect was wet.

Further tests were made with the traps revolving on a turntable, and with each bait dish tested in each trap, so as to evaluate this method of comparing attractants. Statistical analysis of the first test with the same bait in each dish showed no significant difference in the catches of different dishes or traps.

In a plot test for the control of gnat breeding, benzene hexachloride was applied to vegetation at the rate of 5 lb. (gamma isomer) per acre. Treated and untreated half-acre plots were then disk-harrowed, and on the fourth day recovery traps were set to catch any gnats emerging from the soil. A total of 458 *Hippelates pusio* was collected from the untreated plot, as against 13 from the plot treated with insecticide. This differential was even more pronounced after the normal period of development had begun (table 1).

Rat and Rat Ectoparasite Studies. The study of the ecology of roof rats in rural habitats is progressing. Rats in the study area are being live-trapped, marked, and released for recapture to study their movement. Ectoparasites and blood specimens are collected from the captured rats. Preliminary findings suggest very little movement of rats between premises during the late summer, and rats have been found to remain in farm buildings even when the stored food was exhausted. Trapping records indicate that the rat population at the present is about one-fourth as high as in former years for which there are records. There is some evidence that the use of warfarin may be credited for the low rat population. The rat population in the study area has been quite low, however, and the findings may be at variance with those that would be obtained at the time of a high rat population. Rats have not been found to take up harborage in peanut stacks in the fields during the time of harvest. A serum survey for murine typhus complement-fixing antibodies was made during the last 2 months of summer in Thomas, Brooks, and Grady Counties. Incomplete laboratory reports of the survey indicate that typhus is prevalent in rats in Grady County, and is low in Thomas and Brooks Counties (table 2). It is evident that flea control is still effective in Thomas and Brooks Counties, where DDT dusting was done at five different times between 1945 and 1947.

Laboratory studies have shown that a new generation of the oriental rat flea, *Xenopsylla cheopis*, will develop about every 30 days under climatic conditions prevailing in southern Georgia during the summer. The cotton rat has been shown to be a suitable host for this flea in the laboratory.

Epidemiological Studies. Investigations of suspected cases of human murine typhus fever have failed to uncover any proved cases during this quarter. The promiscuous use of antibiotics on all febrile illnesses, and the abnormally prolonged low temperatures of last winter, have been considered as being the possible reason for failure to uncover cases of human murine typhus fever.

Fecal cultures from 2,215 children under 10 years of age revealed 44 (1.98 percent) positive for *Shigella* pathogens, and 20 (0.9 percent) positive for *Salmonella* organisms.

A periodic morbidity study has been in progress since April 23, 1951, and is reported in detail in the report of the Epidemiology Branch.

An investigation by a nurse officer is being conducted of all cases of conjunctivitis occurring in a small village. Visits are made every 2 weeks,

Table 1

EFFECT OF BENZENE HEXACHLORIDE ON EMERGENCE OF GNATS FROM SOIL

Date, 1951	Untreated Plot			Treated Plot		
	Hippelates		Other Arthropods	*Hippelates*		Other Arthropods
	pusio	*bishoppi*		*pusio*	*bishoppi*	
August 21-30	8	6	2,354	11	0	56
August 30-September 8	260	6	2,431	0	0	72
September 8-17	164	2	1,321	1	0	61
September 17	26	1	843	1	0	39
Total	458	15	6,949	13	0	228

Table 2

PREVALENCE OF TYPHUS IN THREE GEORGIA COUNTIES
AUGUST 1951

RAT INCIDENCE as indicated by a positive complement fixation test at 1:4 or higher									
	Grady County*			Thomas County**			Brooks County***		
Species	No. Examined	No. Pos.	% Pos.	No. Examined	No. Pos.	% Pos.	No. Examined	No. Pos.	% Pos.
Rattus rattus	0	0	0	22	0	0	55	0	0
Rattus norvegicus	32	10	31.19	20	1	5.00	17	0	0
R. rattus and R. norvegicus	32	10	31.19	42	1	2.38	72	0	0

*Untreated check county
**Last cycle of dusting with 10 percent DDT completed July 30, 1947.
***Last cycle of dusting with 10 percent DDT completed September 30, 1947.

at which time case histories are taken and physical examinations are performed. From July 1 to October 1, 33 person illnesses were reported or observed in the white race and 22 in the Negro race, giving morbidity rates of 12.0 and 11.3 percent respectively. The frequency rates have been higher in the white race than in the Negro race. Both races show a sharp rise in frequency rates after 1 year of age, this rise being sustained until 10 years of age, when the rate drops sharply.

The helminthic disease survey conducted in Thomas County, Ga., during the summer of 1951 demonstrated a substantial amount of ancylostomiasis and ascariasis in both the white and Negro races. A higher percentage of positive stool examinations was obtained from Whigham and Metcalf than from the larger urban area of Thomasville. No correlation existed between helminthic infection and clinical symptoms, although anemia and eosinophilia were more common in the presence of helminthic infection. Homes of persons harboring *Ancylostoma* ova were more frequently found to be equipped with pit privies or no sanitary method of fecal disposal, while the homes of hookworm-free individuals were more frequently sewered. The relatively small number of individuals included in this survey permit one to draw conclusions only with caution.

FLY-POLIO INVESTIGATIONS

Phoenix, Ariz. Unprecedented rains in July and August at Phoenix reactivated desiccated fly breeding substrates over the entire city and adjacent areas. Prolific widespread fly production followed, the peak densities equaling in magnitude those of the spring period. By extension of working hours and increasing the control force, fly prevalence was reduced greatly, although temporary loss of control did occur in certain sections. Prodigious production of flies in peripheral zones magnified the problem by rapid infiltration of the adult flies into nearby urbanized areas.

The abundance of moisture during the July-August period revealed that the normal reduction of fly populations when high temperatures prevail is not a direct effect of such temperatures, but instead is a reflection of their action in drying out the available fly breeding substrates. The increase in fly densities was correlated with the amount of precipitation. Despite consistent temperatures above 90° F., fly prevalence increased rapidly during weeks 29 through 33.

Fly dispersion studies using flies tagged with radioactive P^{32} were begun in June. In the initial test, 31,000 flies (99 percent *M. domestica*) were removed from the normal population at a packing house, marked with the radioactive agent, and then allowed to escape at the original point of collection. Fifty baited traps served to recapture the specimens, these traps being located in rings at distances 0.5, 1.0, 2.0, and 3.0 miles from the release site (table 3). To insure an equal chance of capture at all distances, the circumferential interval between successive traps in each ring was 0.5 mile; results show an 0.8 percent recovery of marked flies, a preponderance of specimens (88 percent) being taken within 1 mile of the release site. Limited fly dispersion occurred up to 1 mile within 24 hours, movement to greater distances being manifest within 48 hours.

Table 3

TRAP COLLECTIONS POSITIVE FOR RADIOACTIVE FLIES, AND NUMBER OF POSITIVE FLIES TAKEN, SUMMARIZED ACCORDING TO DATE OF COLLECTION AND DISTANCE FROM RELEASE POINT. FLIGHT RANGE TESTS, PHOENIX, ARIZ. RELEASE DATE - JUNE 23, 1951

Date of Collection	½ Mile			1 Mile			2 Miles			3 Miles			No. of Pos. Coll. per Day	No. of Pos. Flies per Day
	No. Coll.	No. Coll. Pos.	No. Pos. Flies	No. Coll.	No. Coll. Pos.	No. Pos. Flies	No. Coll.	No. Coll. Pos.	No. Pos. Flies	No. Coll.	No. Coll. Pos.	No. Pos. Flies		
June 24, 1951	6	2	8	12	1	6	13	0	0	19	0	0	3	14
June 25, 1951	6	4	20	12	5	28	13	3	6	19	2	2	14	56
June 26, 1951	6	4	32	12	5	44	13	4	7	19	0	0	13	83
June 27, 1951	6	2	9	12	3	20	13	2	2	19	1	1	8	32
June 28, 1951	6	3	10	12	4	8	12	2	4	18	1	1	10	23
June 29, 1951	6	3	9	12	3	12	12	1	2	19	0	0	7	23
July 2, 1951	6	3	6	11	4	4	13	1	2	19	0	0	8	12
July 5, 1951	4	1	1	12	3	4	13	0	0	19	1	1	5	6
July 9, 1951	6	1	1	10	0	0	13	0	0	18	0	0	1	1
Total	52	23	96	105	28	126	115	13	23	169	5	5	69	250
% Positive collections per zone		44.2			26.6			11.3			3.0			
% Positive flies per zone		38.4			50.4			9.2			2.0			

The most significant finding of the test concerned the preferential movement of tagged flies into certain portions of the study area. Seven of the 50 traps yielded more than 75 percent of the marked flies. Particularly outstanding was the capture of 108 of the 120 tagged *M. domestica* found on the 1.0 mile ring at 2 collection sites. Analysis of total flies taken at various sites indicates that those locations most attractive to *M. domestica* also produced the highest recovery of tagged flies. Two interrelated factors, distance and area attractivity, thus appear to govern fly movement. Sites of greater attractivity, more distant from the release point apparently may exert equal or greater influence on fly movement than less attractive locations closer to the release point. In this test, area attractiveness appeared to be related to the occurrence of animal shelters.

Space spray tests comparing a pyrethrin formulation (0.05 pyrethrins + 0.75 synergist 264) and a DDT-DMC combination (5 percent DDT and 0.67 percent DMC) revealed that the former gave 93.7 percent reduction of flies 30 minutes after treatment, as against 71.9 percent for the DDT-DMC combination. Although the per gallon cost of the pyrethrin formulation ($0.52) exceeds that of the DDT-DMC mixture, treatment of the same area by the pyrethrin spray required 15 gal., as compared to 28 gal. for the DDT-DMC formulation. Therefore, on a per treatment basis, the pyrethrin formulation was less expensive and more effective.

Charleston, W. Va. In early September, both laboratory and field tests confirmed the presence of dieldrin resistance in house flies (*M. domestica*) at the Charleston project. The field tests consisted of treatments of 18-in. square screened cages with 25 mg. of dieldrin, followed by introduction of specimens captured in the field with a cone net. Initial tests established that flies from areas of Charleston, which had been heavily treated with dieldrin during 1950 and 1951, possessed a high degree of dieldrin resistance (table 4). Tests of flies from areas receiving less intensive dieldrin coverage gave evidence of a lower degree of dieldrin resistance. In other tests using cages treated with DDT at the rate of 200 mg./sq. ft., it was shown that DDT still yielded effective knockdown of Charleston dieldrin-resistant flies.

As a result of these tests, it has been established that resistance to dieldrin developed in the Charleston house fly population within 18

Table 4

Comparison of Knockdown Rates upon Exposure in Screened Cages Treated with 25 mg./sq. ft. Dieldrin Applications of (1) 124 "Musca domestica" Collected from Charleston Blocks 681-682, and (2) 172 "M. domestica" Collected from Untreated Area. August 29, 1951.

Exposure Time (Minutes)	Percent Knockdown	
	Charleston Flies	Check Town Flies
5	0	1
35	0	91
60	4	99
110	9	100
290	36	–

months after the original application. This occurrence of resistance is of particular significance, since *M. domestica* is not the predominant fly in this area, and its rate of reproduction in Charleston is relatively slow in comparison to that in Phoenix. The rapidity of fly reproduction, and the amount of dieldrin treatments, are factors influencing development of resistance; this is indicated by data revealing lower levels of tolerance in Charleston flies from sites characterized by lesser fly potential, and fewer chemical applications. Despite the occurrence of dieldrin resistance in the house fly populations, fly densities in Charleston remained at extremely low levels throughout the quarter.

ECTOPARASITE SURVEY AND EVALUATION

Murine Typhus Activities. A preliminary analysis of rodent examination data for the current quarter shows that, as of October 15, 1,612 examinations of rats had been reported from 8 southern States, Hawaii, and Mexico (the report from the latter supplied by Texas typhus control personnel). The numbers of rats reported examined by each State up to the time of this report for this quarter are: Alabama 481, Florida 85, Georgia 120, Louisiana 247, Mississippi 24, North Carolina 162, South Carolina 51, Texas 418 (plus 23 from Mexico), and Hawaii 1.

A reduction in the percentage of rats infested with *X. cheopis* from 22 percent in undusted premises to 14 percent in DDT-dusted premises was obtained. However, no reduction was evident in the percentage of rats with typhus antibodies.

A more complete analysis of rodent examination data for the 6-month period, January through June 1951, was made. During this period rats were collected in 142 counties in 12 States and Hawaii, plus two border cities of Mexico. Totals of 4,614 and 3,483 rat examinations were reported for the first and second quarters of calendar year 1951 respectively. The greatest number was made by Texas, followed by Alabama, Arkansas, and Georgia. The use of 5 percent DDT dust has almost been discontinued, and the small amount of data on 5 percent DDT dust will hereafter be combined with that on 10 percent DDT dust.

Complement fixation tests for murine typhus were completed on 4,211 rat serums during the first quarter of 1951, and 3,158 during the second quarter. Percentages of positives in eight southern States (listed above) are shown in table 5.

These figures indicate an average reduction due to dusting operations of approximately 25 percent, as evidenced by the prevalence of typhus antibodies in rats. The prevalence of typhus in rats from undusted premises was higher in 1951 than in 1950, being 15 percent in the first quarter of 1951, as compared to 12 percent in the first quarter of 1950; and 10 percent in the second quarter of 1951, as compared to a low of 5½ percent in the second quarter of 1950. This indicates that a gradual upswing in the natural prevalence of typhus in rats from the all-time low in the spring of 1950 may now be occurring.

Natural levels of typhus prevalence in rats from undusted premises appear to be high in Alabama, Georgia, and Louisiana; moderate in South Carolina and Texas; low in Arkansas, Florida, Mississippi, North Carolina, and Virginia; and no infection was found during this period in Kentucky, Oklahoma, or Hawaii.

Table 5

PERCENTAGES OF RATS FOUND POSITIVE FOR MURINE TYPHUS IN EIGHT SOUTHERN STATES

	Survey Projects	Control Projects	
	Undusted Premises	Undusted	Dusted
First Quarter	9%	15%	11%
Second Quarter	5%	10%	8%

EPIDEMIOLOGY BRANCH

REORGANIZATION

Effective September 1, the office of Midwestern CDC Services was discontinued. The Histoplasmosis and Encephalitis Units of this Service were merged into a new Kansas City Field Station and were assigned to the Epidemiology Branch. The entomological and engineering activities formerly assigned to Midwestern CDC have been transferred elsewhere under the direction of the Vector Control and Investigations Branch. The transfer at the end of the quarter of the activities of the Office of the Chief Nursing Consultant and the Veterinary Public Health Branch to the Epidemiology Branch completes the present plans of reorganization of Epidemiology Branch. Drs. William H. Clark and John T. Gentry were added to the staff as assistants to the Chief.

EPIDEMIC INTELLIGENCE SERVICE

On July 2, a group of 21 newly commissioned medical officers and one sanitary engineer reported to Atlanta for an intensive orientation course in epidemiology, biostatistics, and public health administration as applied to communicable disease control.

Upon completion of the 8 weeks of formalized training, participants in the course were assigned to various agencies and stations for the purpose of obtaining carefully supervised field training in the application of epidemiological techniques to communicable disease control. About one-half of the assignments were to State and local health departments to provide a well balanced training program, and about one-half were assigned to CDC Field stations where the individuals will participate actively in the field investigation studies of the several stations.

The principal purposes of the Epidemic Intelligence Service program are:

1. To provide training for professional persons in the methods and techniques of field epidemiology. In the most normal times, there exists a great scarcity of individuals trained in the epidemiological disciplines, and it is hoped that this program may alleviate, to some degree, the shortage of properly trained and qualified persons.

2. To provide a body of persons trained in epidemiological methods to be on call for emergencies requiring such special skills. Such emergencies include naturally occurring outbreaks of disease; the possibility of the occurrence of induced outbreaks must also be considered in time of war.

AIR-BORNE DISEASE STUDIES

The CDC Committee on Airborne Disease Studies has continued in its function of coordination and development of the CDC program in this field. Three major areas of interest have been defined as: (1) collection, (2) identification, and (3) significance.

Primary responsibility for the development of appropriate devices for the collection of airborne pathogens has been assigned to the Technical Development Branch. The chief activity of Laboratory Branch will be the development of methods for the identification of the pathogens collected. The interpretation of the significance of the findings is of primary concern to the Epidemiology Branch.

The regular collection of daily samples of air, using several different collecting methods, is continuing in three stations: Savannah, Ga., New Orleans, La., and Kansas City, Kans. Reports of the findings of these projects, according to a standardized minimum procedure, are being submitted regularly to Epidemiology Branch for analysis. Reports of analyses are returned to the field stations to aid in program direction. It is planned that this program shall continue for at least a year to (1) provide a body of data giving the basic background of normal bacterial flora in the air, and (2) provide data and experience in techniques which will be basic to the further development of methods for the detection of possible pathogenic clouds of organisms.

EPIDEMIC AID

The following requests for epidemic aid have been received from State health officers, from a Naval training station, and from the Division of Foreign Quaratine, Public Health Service:

Richmond, Va. – Suspected equine encephalomyelitis. On July 26, a call was received from the Virginia Department of Health for epidemic aid in an outbreak of a disease suspected of being encephalitis which was occurring in Richmond. Five persons had died within 10 days of a fulminating illness tentatively described as meningitis or encephalitis. An epidemiologist was immediately dispatched from the Communicable Disease Center, and a preliminary investigation was carried out. Although the etiology of the cases was not at that time established, the consistent clinical picture, the high fatality rate, and certain epidemiological associations suggested the possibility of the occurrence of Eastern equine encephalomyelitis. Consequently, epidemic aid services to the State of Virginia were augmented by representatives of the Engineering, Entomology, and Laboratory Branches of CDC. Epidemiological investigations were made of each case, surveys were undertaken of small and large animals and birds in and about the area where the cases had occurred, and surveys of the normal population were instituted.

As greater details of the clinical, pathological and histopathological findings in each patient became available, further refinement of the original diagnosis was possible and it became evident that at least some of the fatal illnesses were more likely bacterial meningitis than virus encephalitis. The field phase of the biological studies was suspended on August 5, pending the completion of laboratory tests for clarification of the diagnosis. Completed laboratory study failed to reveal a viral etiology for any of the cases from which material had been made available.

S. S. Taurinia - Outbreak Suspected of Being Enteric Disease. On August 8, at the request of the Division of Foreign Quarantine, three epidemiologists were dispatched to Charleston, S. C., to board the S. S. Taurinia and render diagnostic and epidemic consultative aid to the Quarantine Officer of Charleston.

The ship had experienced an epidemic of undiagnosed disease during its voyage across the South Atlantic en route from Freetown, British West Africa, to Charleston. The epidemic resulted in the death of three crewmen and illness of varying severity among other members of the crew. Clinical and epidemiological investigation failed to reveal a clear-cut diagnosis of the illness, although it was suspected that infection with one of the enteric group of organisms was responsible. Specimens for laboratory examinations were collected from members of the crew; upon examination by the CDC laboratories, no causative organism could be found.

Since it was suspected that some of the difficulties connected with the laboratory diagnosis of this outbreak were related to the indiscriminate use of antibiotics aboard the vessel, arrangements were made to board the vessel for a second time when it reached Baltimore, Md. It was hoped that specimens obtained at this time would be free of the effects of antibiotic therapy, and would reveal the etiology of the epidemic. However, specimens collected in Baltimore and examined by both the Maryland State Department of Health Laboratories and the Laboratory Branch, CDC, Chamblee, Ga., again failed to reveal the etiology of the outbreak. At the present time, the cause of illness among the crewmen of the S. S. Taurinia remains undetermined.

Memphis, Tenn. – Poliomyelitis. On August 16, in response to a request from the Naval Air Training Command, Pensacola, Fla., an epidemiologist was dispatched to the Naval Air Station at Memphis, Tenn., to investigate 10 cases of poliomyelitis which had occurred in the previous 2 months. Five of the cases had occurred among Navy personnel, and five had developed among dependents of Navy personnel. A review of clinical, laboratory, and pathological data confirmed the diagnosis of poliomyelitis. Three of the five cases occurring in Naval personnel were bulbar in type, and had resulted in two deaths. Nothing was found by epidemiological investigation to suggest a common source of infection. A review of the occurrence of poliomyelitis in the surrounding area indicated an attack rate of approximately 29 per 100,000; the attack rate among Naval Air Station personnel was approximately 45 per 100,000, and was not considered to be significantly different from that of the surrounding area. It was felt by the investigating epidemiologist that the occurrence of poliomyelitis at the Naval Air Station was, in large part, a reflection of the occurrence in the surrounding civilian population.

Shreveport, La. – Poliomyelitis. On August 27, at the request of the State Health Officer of Louisiana, an investigation was undertaken of the outbreak of poliomyelitis occurring in the area of Shreveport. During the spring and summer of 1951, an unusually severe epidemic of poliomyelitis

had occurred in the neighborhood of Shreveport, involving more than 200 persons with an attack rate of more than 130 per 100,000 population. In general, however, the epidemic was relatively mild, in that severe illnesses had been relatively few in number, and in that only four fatalities had occurred. Epidemiological study indicated that the epidemic had reached its peak in the latter part of July and early August, and at the time of investigation was declining in a slow but regular manner. No particularly unusual findings were observed in this outbreak, although it was noted that the epidemic had apparently run its course somewhat earlier among the Negro population as compared to the course in the white population. Prompt and calm action on the part of the community had resulted in an excellent program for the care of patients, and although the level of public concern was high, hysteria was not a major problem. The governing bodies of the school systems of both Shreveport and Caddo Parish had received recommendations from their respective boards of health that the opening date of school be postponed for an undetermined but brief period. Both boards of health made such recommendations with the realization that there was little evidence suggesting that the opening of schools influences the natural course of an epidemic of poliomyelitis; however, it was felt that such a temporary postponement was consistent with other recommendations made during the summer for conduct during the epidemic.

INFECTIOUS HEPATITIS CONFERENCE

In August, an informal conference was held with Drs. Joseph Stokes, Jr., Gaylord Anderson, and Vernon Knight, CDC Consultants, to discuss appropriate activities which CDC might undertake in the development of a hepatitis control program. It was recognized that recent developments, including the reported growth of the infectious hepatitis virus in embryonated eggs, the development of a diagnostic skin test, and the demonstration that small doses of gamma globulin serve as a prophylactic agent, are useful tools which provide a basis for more effective investigations of outbreaks of hepatitis in the future and eventually may provide the basis for a control program. Furthermore, the need for accurate information services regarding the possible occurrence of homologous serum jaundice following the use of plasma, immune serum, or other biological products containing human blood, was recognized. Also, the availability of diagnostic agglutination tests for leptospirosis provides a tool for their identification and for the definition of leptospirosis as an epidemiological problem. It was informally agreed that CDC would attempt to institute effective utilization of these new tools, and to define their usefulness. It was further agreed that at some time in the future, it would be desirable to call a conference of all parties interested in the field of infectious hepatitis.

EVALUATION

Malaria Surveillance. The occurrence of large numbers of cases of malaria among veterans of the Korean campaign was recognized during the quarter. A few cases in Korean veterans had been observed during May and June of this year, but the impact was not felt until July and August, when reports were received in large numbers from all of the States participating in the Malaria Surveillance Program. The malaria surveillance personnel were called upon to make investigations, necessitating the initiation of a simplified form of inquiry, designed to separate the Korean cases from possible indigenous cases. Detailed emphasis was placed upon these non-Korean cases to determine whether or not they represented instances of indigenously acquired malaria.

By special request of CDC, the National Office of Vital Statistics arranged for malaria to be added to the list of diseases reported weekly from all States in the country. A distinction between military cases and civilian cases was requested, and this is now a regular feature of the weekly morbidity report. Provisional figures from January 1 through September 1951 indicated that 3,902 malaria cases were reported for the United States, of which 2,921 were recorded as military cases, and 852 as civilian cases. Many of the latter were known to be recently discharged Korean veterans, and 109 cases were unspecified as to source.

There are major differences in the completeness of the reporting from different States and there is a substantial delay in receipt of the figures. Furthermore, the number of cases introduced will depend upon the unpredictable and variable flow of returning veterans, and on the effectiveness of the prophylactic treatment of returning troops with the new drug, primaquine.

Medical epidemiologists were assigned to the States of Texas and Louisiana to participate in the Malaria Surveillance Program as well as in

the Epidemic Intelligence Service, and arrangements were completed for the assignment of a nurse epidemiologist to the State of Tennessee at the end of the quarter. These additions materially strengthened the force of epidemiological personnel in the Malaria Surveillance Program. Epidemiologists trained in malaria appraisal are now assigned to 9 of the 13 traditionally malarious States.

The number of cases of malaria, typhus, and other communicable diseases investigated and appraised by CDC and State collaborators in this program is shown in table 1. Of the 396 malaria appraisals completed during the quarter, 220 were positive; nearly all were from Korea. There were only three cases of confirmed malaria in which the epidemiological evidence indicated a natural origin within the United States; one each was from the States of Georgia, Mississippi, and Tennessee. Detailed investigation in each instance failed to reveal any source of infection, or evidence of the existence of other cases of malaria in the vicinity.

Typhus Appraisal. The appraisal of cases of

Table 1

DISEASE INVESTIGATIONS AND APPRAISALS

July through September 1951

Malaria Appraisals With Onsets During the Quarter

State	Total	Positive	Presumptive	Doubtful	Not Malaria	Incomplete
Alabama	35	19	3	3	10	
Arkansas	33	10		3	20	
Florida	11	10	1			
Georgia	83	10	72	1		
Louisiana	6	5	1			
Mississippi	25	24	1			
South Carolina	56	55	1			
Tennessee	50	35	8	4		3
Texas	0					
Total	299	168	87	11	30	3

Typhus Appraisals with Onsets During the Quarter

State	Total	Positive	Presumptive	Doubtful	Not Typhus	Incomplete
Florida	3	1	1		1	
Mississippi	3		1	1	1	
South Carolina	1			1		
Total	7	1	2	2	2	

Total Communicable Disease Appraisals Performed During the Quarter

State	Total	Malaria		Typhus		Other Communicable Disease Investigations
		Appraisals	Positive	Appraisals	Positive	
Alabama	161	70	31	22	2	69
Arkansas	60	59	25	0	0	1
Florida	39	15	13	13	3	11
Georgia	93	93	15	No report		
Louisana	6	6	5	0	0	0
Mississippi	153	24	22	1	0	128
South Carolina	72	71	65	1	0	0
Tennessee	58	58	44	0	0	0
Texas	0					
Total	642	396	220	37	5	209

typhus fever has been limited because of the requirements for concentration on study of Korean malaria cases. Of seven appraisals of typhus fever, the onset of which occurred during this quarter, only one definitely was found to be typhus fever; this case was in Florida.

National Morbidity Reporting. The Epidemiology Branch has participated, with the National Office of Vital Statistics and the Sub-Committee on National Morbidity Reporting of the Association of State and Territorial Health Officers, in planning for a revision of the lists of diseases which States report regularly to the National Office of Vital Statistics, and for modernization of the procedures of reporting. This program was initiated by a report on the subject prepared by an intra-Public Health Service Committee, completed in September, 1950.* The broad subject was then investigated in detail at the Conference of State Epidemiologists, held in Atlanta in April 1951. The recommendations of the Conference were submitted to each State health officer, with the request for comments and corrections. The Sub-Committee on National Morbidity Reporting met in Atlanta for a 3-day period in September 1951 to review these comments and to prepare a final report for submission in San Francisco in October to its parent body for final approval and implementation. The report was also to be submitted to the Committee on Administrative Practice of the American Public Health Association for its consideration.**

INVESTIGATIONS

KANSAS CITY, KANS., FIELD STATION:

Encephalitis. An intense search for human cases of encephalitis was carried out in cooperation with the physicians of Weld County, Colo., St. Louis, Mo., and Ft. Scott, Kans. No reports of epidemics of human encephalitis have been received. During the summer only two possible cases have been discovered, one near Greeley, Colo., and another in St. Louis. The St. Louis case was fatal, and autopsy material has been obtained for virus studies.

In Greeley, studies of the population for the presence of antibodies to the encephalitides have been continued on a routine basis. Large numbers of serums have been obtained and have been sent to the Virus and Rickettsial Laboratory, CDC, Montgomery, Ala., for testing.

Similar to the situation in humans, there have been very few reports throughout the middle west of cases of encephalomyelitis in horses; a few cases have been reported, and are presumably genuine instances of encephalomyelitis, from Weld County, Colo. The surveys for antibodies in the serums of horses have been completed and specimens have been sent to the Virus and Rickettsial Laboratory for tests.

Large numbers of bird blood samples have been collected for the attempted isolation of virus, and blood serum has been taken from nestling birds for antibody studies. Sentinel flocks of chickens have been maintained at strategic points near the collecting light traps, and have been bled each week and specimens stored for later attempts to isolate virus. In Kansas City two flocks of pigeons have been maintained. These birds were caught in Weld County, Colo., and after testing for the presence of Western equine antibodies, were divided into two flocks – one containing positive birds and the other containing negative birds. Studies are being carried out on these two flocks of birds to determine which, if any, of the birds transmit antibodies through the egg to the offspring.

Light traps for the collection of mosquitoes have been maintained in Weld County, Colo., Bourbon County, Kans., and in St. Louis, Mo., during the winter months. Substantial numbers of mosquitoes have also been caught and prepared for attempts at virus isolation.

Conjunctivitis Studies. In August a patient was seen who was suspected of having poliomyelitis or encephalitis. Upon examination, the patient was found also to have a severely inflamed eye. A search for further cases of conjunctivitis in and about the area where this patient lived (Greeley, Colo.) revealed a substantial number of other persons ill with conjunctivitis. In Greeley, a total of 114 cases was discovered, and 56 of these were examined from the clinical and epidemiological point of view. Forty-four of the patients were found to have had conjunctivitis, sometimes in association with lesions of the pharynx; there were also a number of cases in which lesions of the pharynx were the prominent findings. Ophthalmological examination of 54 cases revealed that in 13 cases the cornea had been infiltrated by whitish plaques of small diameter. On the basis of these findings, the disease was tentatively diagnosed as epidemic keratoconjunctivitis.

*See CDC Bulletin X(2): 4-12 (1951).

**For the approved recommendations see page 50 of this Bulletin.

Epidemiological studies of 58 patients indicated that all ages were affected, but the majority of cases occurred in persons between the ages of 5 and 16. The largest number of cases occurred during a 1-week period early in August, and it was found that the great majority of persons becoming ill during this period had been swimming in a public pool within a short period prior to the onset of their illness.

Laboratory studies of specimens obtained from patients in Greeley have thus far failed to reveal the etiological agents. All virological studies had not been completed at the time of this report, however.

Histoplasmosis Studies. Many clinical and field studies have been continued. Studies have been conducted concerning the effects of antibiotics on *Histoplasma;* these studies have for their purpose the development of possible therapeutic procedures in the treatment of clinical histoplasmosis, and also have application to the betterment of procedures utilized for obtaining *Histoplasma* from air samples. Preliminary studies are continuing on the effect of humidity and temperature on the growth of *Histoplasma.* These studies suggest that *Histoplasma* is able to grow only under quite restricted conditions of temperature and humidity, and it appears possible that these factors may influence the epidemiology of this disease considerably.

Field studies relating to the use of the histoplasmin skin test in animals have been conducted. It has been demonstrated that the use of histoplasmin skin testing material is a feasible procedure in various domestic animals. In field testing procedures, histoplasmin sensitivity rates in animals have been shown to increase with age, the rates being lower in young animals and increasing in older ones in much the same manner as is observed in humans. Sensitivity rates have also been shown to vary, depending upon geographic location and length of residence of the animals tested.

Clinical studies of patients and cases referred for diagnostic confirmation have continued. This is a continuing undertaking which involves service of diagnostic nature to the physicians of a wide area through the middle west, and which has been most useful in case-finding procedures of value in long-range studies. During the quarter approximately 150 serums from patients being observed over a period of time have been submitted to the Laboratory Branch for complement fixation tests. In addition, 114 serums have been submitted from outside sources.

Air Sampling Studies. According to the technique prescribed for the several sampling stations engaged in the continued air sampling studies, daily air samples have been taken. The results of these samplings are being evaluated. Attempts have been continued to isolate the *Histoplasma capsulatum* from the air of a number of areas. Studies have been conducted of a considerable number of antibiotics in connection with the air sampling techniques, in order to provide, if possible, selective media for the isolation of *Histoplasma* from the air.

Daily temperature and humidity readings are being taken in a number of locations around the Kansas City Field Station, in an effort to determine those areas in which *Histoplasma* might be obtained from the air.

Poliomyelitis Studies. The studies of poliomyelitis carried out in conjunction with the University of Kansas Medical School have been continued. Approximately 650 persons from Junction City, Kans., have been tested for the presence of serum antibodies against the Lansing strain of poliomyelitis. Serum specimens are obtained from all new patients with poliomyelitis and from members of their families. Stool specimens are also secured for the isolation of virus.

At least 15 stools have been obtained from patients with paralytic poliomyelitis in the Kansas City area and have been inoculated into monkeys. Of this number, 10 have resulted in the isolation of a strain of poliomyelitis; these strains have also been passaged into cotton rats.

Hepatitis Studies. Collaborative studies of infectious hepatitis occurring in and around Boonville, Mo., have continued. During the summer, 22 additional cases of hepatitis have occurred in this area, but only 6 were in areas previously studied while the remainder were in the town of Boonville itself. A visit to the area by an epidemiologist from the Kansas City Field Station and by an infectious hepatitis consultant indicated the possibility of utilizing the area for further field tests on the efficacy of gamma globulin in the prevention or abortion of clinical infectious hepatitis. Arrangements have been made for a field test in the grade school at Boonville. Volunteer pupils were divided into groups, one of which received gamma globulin, one received the skin test antigen, and one received saline as controls. During the coming months pupils who

are absent will be visited by the county health nurse in order to ascertain the diagnosis, if illness is the reason for absence.

CHARLESTON, W. VA., FIELD STATION:

The epidemiological studies of poliomyelitis and minor illnesses have continued. During this period, only three cases of poliomyelitis, all paralytic, have been reported. Such evidence suggests that the area will be quite free of poliomyelitis during the 1951 poliomyelitis season.

The continuing morbidity survey has operated throughout the quarter in District 1, a crowded area of low economic status, and in District 4, an area of middle socioeconomic class. The total incidence of minor illnesses has remained at the low level characteristic of the summer months. During the latter part of July and early August, however, a disease syndrome best described as "summer sore throat" was prevalent in District 4. Appearing to be concentrated in particular blocks of the district, the syndrome involved up to 100 percent of the younger age groups. Laboratory specimens have been obtained from a number of persons with this illness, and from their familial contacts, in order to attempt the definition of the etiological agent.

PHOENIX, ARIZ., FIELD STATION:

Although it has not been possible to fully appraise the occurrence of poliomyelitis on a current basis, the incidence of the disease has been moderately high with an estimated attack rate of 15 paralytic cases per 100,000 population in urban Phoenix.

The continuing morbidity survey was operative throughout the quarter. In general, the incidence of minor illness was at a low level, similar to that observed in Charleston, W. Va. In this area, as in Charleston, a "summer sore throat" was observed in a considerable number of persons.

THOMASVILLE, GA., FIELD STATION:

Murine Typhus Fever Investigations. The effort to measure the incidence of human murine typhus fever in three counties of southern Georgia has continued; no new cases were discovered during the quarter. Thus far in 1951, only one case has been uncovered in the three counties. The failure to find new cases of murine typhus fever has raised some question about the merit of present case-finding techniques. Among the factors which may have caused apparently poor case-finding for this year are the promiscuous use of antibiotics in the treatment of all febrile conditions, thereby possibly masking cases of murine typhus fever before the diagnosis is established, and the abnormally prolonged low temperatures during the previous winter which may have reduced the number of rat ectoparasites below the threshold of effective vectoring.

Diarrheal Disease Investigations. Anal swab cultures were collected from 2,215 children under the ages of 10 years for the purpose of attempting to isolate *Shigella* and *Salmonella* organisms. Of this number, 44, or 1.9 percent, were positive for recognized *Shigella* pathogens, and 20, or 0.9 percent, were positive for *Salmonella*.

The culturing of various parts and organs of hogs and cattle slaughtered in the area has continued in an effort to isolate *Salmonella* organisms. Since July 1, 550 specimens have been cultured, with 10 isolations of *Salmonella* organisms.

As well as the attempts to culture *Salmonella* organisms from slaughterhouse material, attempts have been made to culture *Salmonella* from meat and meat products obtained from the household. Two hundred and seventy-nine household meat specimens were cultured, and 2 were found to contain *Salmonella*. None of the specimens obtained after cooking was found to contain organisms.

A total of 1,800 yard animals, resident in the study area, was cultured by the anal swab technique; 5, or 0.3 percent, were found to carry *Salmonella* organisms. In addition, 105 animals from a local veterinary hospital were cultured in the same manner, and 11, or 10.5 percent, were found to be positive for *Salmonella* organisms.

Morbidity Survey. The periodic morbidity survey, which was initiated in April of this year, has been continued. Visits have been made to homes in two similar areas at intervals of 4 and 8 weeks, in order to determine the period over which memory for individual symptoms is reliable. It was noted that attack rates for illnesses reviewed in retrospect were markedly less as the time from the date of interview increased. Thus, attack rates in the week preceding the interview were in the neighborhood of 3 per 100, while attack rates for the period 7 and 8 weeks preceding the interview were in the neighborhood of 0.5 per 100.

Conjunctivitis Investigations. An investigation is being conducted of all cases of conjunctivitis

which occur in the village of Barwick, Ga., in order to determine the incidence of the disease and the relative importance of personal contact in the transmission of the infection from person to person. All residents of Barwick are included in the study; this constitutes 273 white persons and 194 Negroes. In the absence of bacteriological studies, conjunctivitis has been arbitrarily defined as the presence of injection of the bulbar conjunctiva or the finding of a purulent exudate within the conjunctival sac. During the period July 1 through September 1, 33 person-illnesses were reported or observed in the white race, a morbidity rate of 12 percent, and 22 person-illnesses were reported in the Negro race, a morbidity rate of 11.3 percent. The majority of cases was reported in the younger age groups; 30 of the 33 illnesses observed in white persons occurred in individuals between the ages of 1 and 9, and 14 of the 22 illnesses observed in Negroes occurred in the same age group.

NEW ORLEANS, LA., FIELD STATION:

The continuing observations of the bacterial flora of premature infants, being conducted in conjunction with the National Institutes of Health, have been maintained.

The extensive statistical analyses of the results of continuing study on the premature nursery, of the data collected from Pharr, Tex., of data from the Fresno County, Calif., diarrhea and dysentery study of 1950, of the Thomasville diarrhea and dysentery study and morbidity survey data, and on material collected in Korea, are continuing. The routine air sampling studies, both in the City of New Orleans and within the premature nursery, have also been carried on at a minimum procedure level.

Sarcoidosis. A collaborative study of this disease was initiated during the quarter with Drs. Max Michael and Paul Beeson of the Veterans Administration Hospital Facility, Chamblee, Ga., and Emory University Medical School. A careful analysis had been made previously of 350 patients who were found during their Army service to have sarcoidosis. This study revealed that nearly all of this group of patients were born in the Southeastern United States; few individuals with sarcoid were born in other areas, although a much broader distribution on the basis of population densities would have been expected.

Such a clear geographic concentration of cases appears to warrant further study as a primary clue toward establishing the etiology and epidemiology of this disease. Arrangements have been made for Epidemic Intelligence Officers to conduct more detailed epidemiological investigations than are now available of cases near their place of assignment. The first studies will be directed toward a more precise definition of the residence and travel histories of individuals upon whom present data do not indicate residence in the Southeast.

LEPROSY CONTROL

Medical Director Lucius F. Badger departed in September for an extended trip in company with Dr. James Doull, of the Leonard Wood Memorial. Dr. Badger was to visit South Africa, Egypt, India, Ceylon, the Philippines, Japan, and the Hawaiian Islands, and was to formulate a plan for the evaluation of chemotherapeutic agents used in the treatment of leprosy.

LABORATORY BRANCH

PROGRAM REVIEWS

For the Texas State Department of Health, 13 of the 19 Texas Regional Laboratories were reviewed by three consultants during July and August. In each of the 13 cities and at Austin special lectures and round-table discussions were presented to approximately 600 persons.

In the States of Rhode Island and Maine, and for the Territory of Alaska, formal laboratory program reviews were completed in September.

Upon invitation, a brief review of sanitary bacteriology laboratory practice at the Base Laboratory, Shepard Air Force Base, was made.

LABORATORY TRAINING SERVICES

There were 90 students in attendance for the eight scheduled training courses offered (table 1); 10 percent were foreign students, 20 percent were from State and local public health agencies, 14 percent were from the Public Health Service, while 34 percent came from other Federal agencies. Cooperatively with the Veterinary Public Health Branch the course for Diagnosis of Rabies was offered for 10 students.

At Portland, Oreg., 101 persons, and at Seattle, Wash., 40 persons, attended 5-day State agency-sponsored training courses offered by the Mycology Laboratory and by other agencies.

TECHNOLOGICAL SERVICES RENDERED

Technological services rendered to State, local, and Public Health Service agencies within the United States are shown in figure 1. In addition, these services were furnished to agencies in Alaska, Hawaii, Puerto Rico, Virgin Islands, Argentina, Australia, Belgian Congo, Bolivia, Brazil, Canada, China, Cuba, Denmark, Egypt, El Salvador, England, Germany, Indonesia, Israel, Mexico, Okinawa, Peru, Sicily, Spain, and Uruguay.

Among the 24,427 specimens examined by the various laboratories in Atlanta, Ga., and Montgomery, Ala., 17,371 were tested for CDC activities.

STREPTOCOCCUS STUDIES

For special studies, *Streptococcus* cultures which cannot be typed with the precipitin test are to be sent to the Public Health Laboratory Service in England.

METHODOLOGY RESEARCH

PVA fixation of fecal specimens for the diagnosis of amebiasis gives good results with trophozoites of amebae other than *Dientameba fragilis*; modifications of the fixative were tested to demonstrate this species more clearly. Among 119 specimens examined, no positive specimens were found from PVA preparations that were not also detected on direct microscopic study, but many species were identified with more certainty on the stained slides.

Final studies were completed to evaluate four corn meal agar culture media proposed for identification of *Candida albicans*.

The Nursing Research Laboratory completed 3,750 tests on disinfection techniques for oral and for rectal thermometers; from these tests, 240 staphylococci were isolated and identified while 159 streptococci, 53 pleomorphic rods, and 62 miscellaneous bacteria were sent to other CDC laboratories for identification.

A State department of health laboratory and a Veterans' Administration laboratory will engage in evaluation of the leptospirosis agglutination test with the Special Bacteriology Laboratory at CDC.

The chromatographic amino acid patterns of globulin from tuberculosis patients are being compared with those of normal humans to seek a difference constant enough to be of diagnostic value.

As a part of the general review of factors in the laboratory cultural procedures which may be inhibitory to growth of tubercle bacilli, the toxicity of phenol red and of malachite green for *Mycobacterium tuberculosis* are under study.

In the Clinical Pathology Laboratory investigations have begun to evaluate methods for measuring blood lipids, for determining prothrombin consumption time, and for the determination of clotting time.

Adequate amounts of *Salmonella typhi* bacteriophage have been prepared and stored to meet foreseeable demands. Some of the types most difficult to prepare have been produced in a more satisfactory manner by growth on agar inoculated with carefully controlled amounts of 'phage and bacteria.

Studies have begun to evaluate the diagnostic efficiency of the Tarshis-Frisch blood agar medium for the culture of tubercle bacilli.

REFERENCE DIAGNOSIS

The Protozoology and the Helminthology Laboratories received 507 specimens from 25 States. Among these, a cellulose tape rectal swab preparation from a human contained lepidopterous larvae.

In the Medical Entomology Laboratory, 1,007 specimens were examined for agencies

Table 1

TRAINING COURSES PRESENTED BY LABORATORY SERVICES

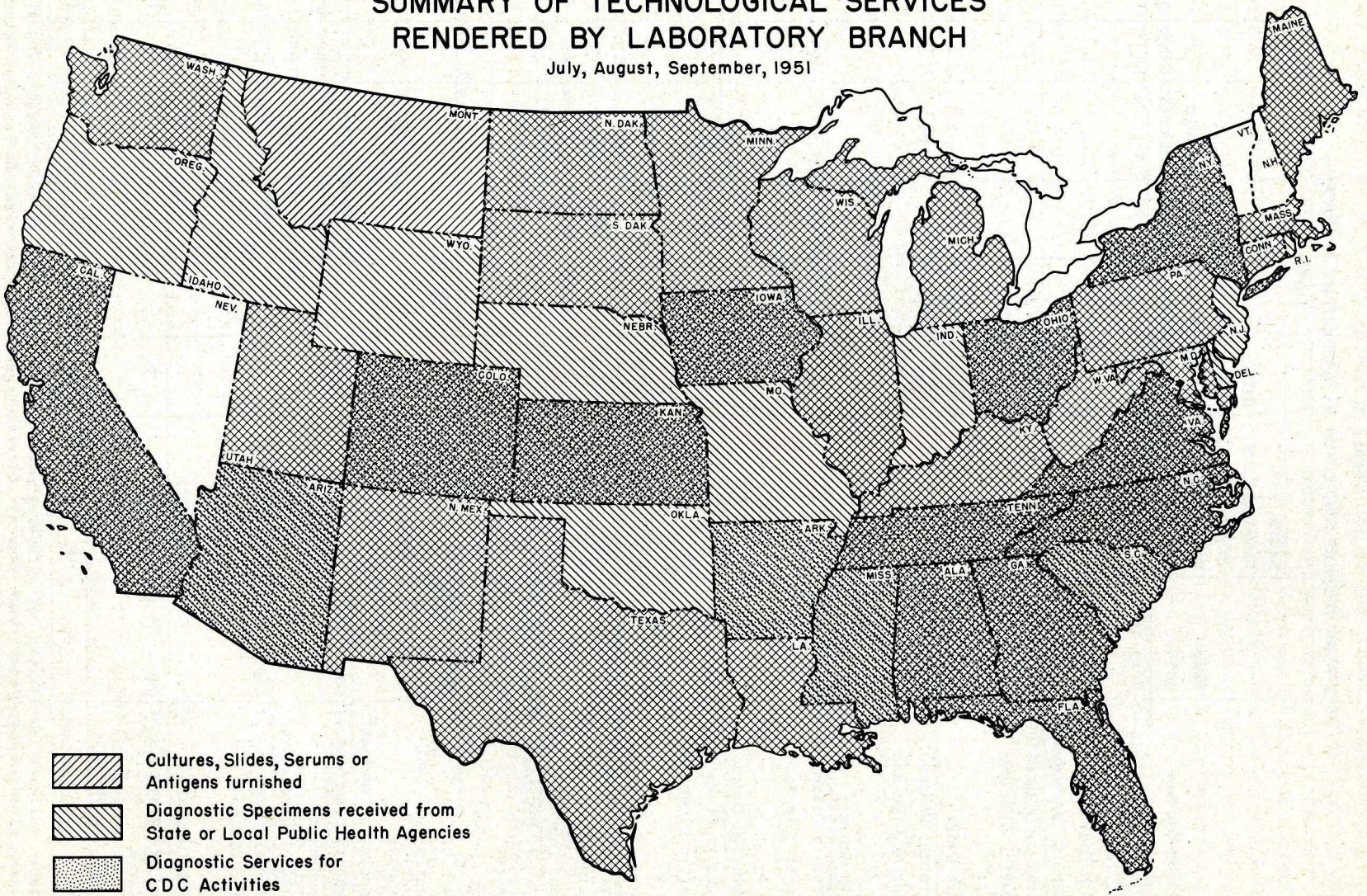
Training Courses	Date 1951	Students							
		State, County, City Health Dept.	U. S. Public Health Service	Other Federal Organizations	Hospitals	Universities	Foreign Students*	Other	Totals
Laboratory Diagnosis of Syphilis** (Ninth Course) By special arrangement	July 16-27	-	2	2	-	-	-	-	4
Laboratory Diagnosis of Bacterial Diseases Part 1 (Fifth Course)	Aug. 27 to Sept. 7	3	4	6	4	-	2	-	19
Laboratory Diagnosis of Bacterial Diseases Part 2 (Fifth Course)	Sept. 10-21	3	4	6	2	-	3	-	18
Laboratory Diagnosis of Parasitic Diseases Part 1 (Eighteenth Course)	Sept. 4-21	5	1	11	1	-	2	1	21
Laboratory Diagnosis of Parasitic Diseases Part 2 (Eighteenth Course)	Sept. 24 to Oct. 12	-	1	10	-	-	2	-	13
Laboratory Diagnosis of Virus Diseases (Second Course)	Sept. 10-21	5	-	-	-	2	-	1	8
Laboratory Diagnosis of Syphilis** (Tenth Course)	Sept. 10-21	4	-	1	1	-	1	-	7
Identification of Medically Important Arthropods By special arrangement	Sept. 10-21	-	-	-	-	1	-	-	1
Laboratory Diagnosis of Tuberculosis By special arrangement	Sept. 17-21	-	-	-	-	-	1	-	1
Laboratory Diagnosis of Enteric Diseases Part 1 (Fourth Course)	Sept. 24-28	2	3	-	3	-	1	-	9
Laboratory Diagnosis of Rabies*** (Seventh Course)	Sept. 24-28	3	1	5	-	-	1	-	10
Total		25	16	41	11	3	13	2	111

*Foreign students represented the following countries: Belgium, Ceylon, Haiti, Italy, and France.
**Courses given in cooperation with Venereal Disease Research Laboratories, Division of Venereal Disease.
***Course given in cooperation with Veterinary Public Health Branch, CDC.

Figure 1

SUMMARY OF TECHNOLOGICAL SERVICES RENDERED BY LABORATORY BRANCH

July, August, September, 1951



FSA-PHS

CDC-ATLANTA, GA.

NOV. 1951

in 11 States and Okinawa. Among these specimens were: rat-tailed maggots (*Tubifera tenas*) from a human case of myiasis, and a female *Dermacentor variabilis* from a child with tick paralysis.

From one rheumatic fever study, 230 strains of streptococci have been received and lyophilized for group and type determination; 30 percent could not be activated. Among the viable isolates, 131 cultures were Group A, with types 4, 12, and 28 predominant; 3, Group B; 10, Group C; 7, Group D; and 7, Group G.

Veterinary laboratories submitted small numbers of streptococci for identification. Groups B, C, G, and L were found, and one culture from bovine mastitis was of Group A, type 12.

All the 410 specimens submitted for *Leptospira* agglutination were tested against *Leptospira icterohaemorrhagiae, Leptospira canicola,* and *Leptospira pomona*; 29 serums reacted at significant titers. Paired serums from one person in Indiana and a single serum from Nebraska reacted at titers suggestive of *pomona* infection.

The Veterinary Laboratory received 103 specimens for virus isolation. Pseudo rabies was found in a rabbit brain from Louisiana, rabies was recovered from a human brain, and psittacosis was isolated in three pigeons from Minnesota.

Serologic tests for evidence of virus disease totaled 2,996 during the quarter, and of these, 959 were for CDC activities in Colorado, Georgia, Kansas, Missouri, and Ohio.

The complement fixation tests were positive in 131 of 1,322 tests; 118 for mumps, 6 for lymphocytic choriomeningitis, and 7 for psittacosis - LGV antigen.

Neutralization tests were positive in 35 of 1,391 tests: 9 for Eastern equine encephalomyelitis (Florida and Louisiana), 18 for Western equine encephalomyelitis (Colorado-CDC, 17; Louisiana, 1), and 8 for St. Louis encephalitis (Colorado-CDC, 7; Oklahoma, 1).

From Oklahoma came the only positive serum of 264 submitted for the influenza hemagglutination test.

Poliomyelitis virus was isolated from 4 of 217 specimens submitted for virus isolation. Of these, 161 came from CDC activities in Arizona (3 isolations), Colorado (1 isolation), and Kansas.

Public Health Service activities in Santa Fe and Kodiak, Alaska, the New Mexico and the Washington State Units, the Salt Lake City Health Department, and the Army Proving Grounds at Dugway, Utah, submitted 2,533 rodents and 9,428 ectoparasites for plague detection. Only the collections from Washington were positive.

Plague was demonstrated twice in Lincoln County, Wash. Fleas were studied from collections of *Lagurus curtatus* at a site 12 miles southeast of Wilbur and from a site 17 miles north of Odessa.

Tularemia was found in *Amblyomma americanum* from a CDC tick collection from Arkansas; 49,766 ticks and 12 fleas were collected in Arkansas and Georgia to be examined for pathogenic bacteria.

In California and Washington, none of 7,662 domestic rats and none of 13,130 fleas on these rodents showed plague.

TECHNICAL CONSULTATION SERVICES

The Enteric Bacteriology Laboratory received 106 *Salmonella* cultures from two surveys on pollution in irrigation waters in Colorado. These and other cultures tested by this laboratory are listed in table 2.

There were 285 blood films received by the National Depository for Positive Malaria Films during the quarter.

Malaria blood films examined are shown in table 3.

A representative of the Laboratory Branch participated in discussions of the Joint Dysentery Unit activities in Korea at the meeting of the Enteric Disease Committee of the Armed Forces Epidemiological Board in Washington.

Serving as referee for the Texas State Department of Health evaluation program for parasitological diagnosis, the Laboratory Branch examined 15 specimens.

Reports from the Louisiana intrastate parasitological evaluation program were graded and the results were returned to the Louisiana State Department of Health.

For the Army Corps of Engineers, arrangements have been made to examine representative portions from collections of mosquitoes

and ticks in the Arkansas-White-Red River Basin study; identifications will be checked and correctly determined specimens will be furnished to the field workers.

The Mycology Laboratory received 513 specimens from 31 States, the District of Columbia, and Canada. Isolated and/or identified among these were 138 pathogenic fungi as follows:

Candida albicans	81
Trichophyton rubrum	17
Geotrichum candidum	14
Trichophyton mentagrophytes	8
Microsporum audouini	5
Actinomyces bovis	5
Trichophyton tonsurans	4
Microsporum canis	1
Epidermophyton floccosum	1
Sporotrichum schenckii	1
Blastomyces dermatitidis	1

The special Bacteriology Laboratory received and isolated and/or identified 88 cultures (table 4).

Table 2

ENTERIC BACTERIOLOGY LABORATORY REFERENCE DIAGNOSIS CULTURES

Shigella	292
Salmonella	651
Paracolon:	
Escherichia-like	31
Intermediate	35
Aerogenes-like	20
Providence	22
Arizona	32
Bethesda	44
Coliform Intermediate	7
Aerobacter	2
Escherichia coli	41
Klebsiella	41
Proteus	31
Pseudomonas	11
Bacillus	2
Micrococcus	2
Alcaligenes	1
Mimeae	2
Flavobacterium	1
Contaminated	1
Broken in transit	4
Nonviable	10

EPIDEMIC AID

Blood samples from 23 crew members of the ship Taurinia were examined for malaria parasites; all were negative.

From the Paulding, Ohio, survey, 60 of 294 serums reacted in the mumps complement fixation test.

From the Richmond, Va., collections, 643 tests were performed with 122 human serums and with 11 horse serums; 45 human serums reacted with mumps antigens.

SERVICES TO CDC PROGRAMS

For the CDC-State typhus program, 1,755 rat serums were tested for murine typhus antibodies; 3.2 percent were positive (see table 5). None of the positive serums reacted with the rickettsialpox antigen used to check for nonspecific reactions with murine typhus antigen.

For the Kansas City CDC Field Station,

Table 3

MALARIA BLOOD FILM SLIDES EXAMINED

States	Total	Unsatisfactory	Positive
Arkansas	1,538	42	0
Georgia	372	4	0
South Carolina	7,355	52	(24) Known Positive Control Slides
Bird Malaria Blood Film Slides Examined for Kansas City Field Station			
Colorado	490	16	26 Bird Malaria 1 Microfilaria

4 of 35 animal serums were found to react with histoplasmosis antigen.

The Blood Parasite Laboratory found 1 filarial infection and 25 malaria infections among 490 bird blood films examined for the Kansas City Field Station.

Table 4

REFERENCE DIAGNOSIS CULTURES ISOLATED AND/OR IDENTIFIED BY THE SPECIAL BACTERIOLOGY LABORATORY

Alcaligenes-like	11	Paracolon *Aerogenes*	1
Bacillus	4	Paracolon "2991"	5
Clostridium botulinum	1	*Shigella* spp.	2
Clostridium perfringens	1	*Proteus*	1
Clostridium spp.	3	*Micrococcus*	6
Corynebacterium (diphtheroid)	2	*Mimeae*	22
Corynebacterium acne	1	*Pseudomonas*	4
Escherichia-like	3	*Streptococcus*	2
Aerogenes-like	2	Unidentified	9
Salmonella typhi	1	Nonviable	7

Table 5

SEROLOGY LABORATORIES: COMPLEMENT FIXATION TESTS RAT SERUMS TESTED AGAINST MURINE TYPHUS ANTIGENS

Source of Specimen	Total No. of Serums	No. Pos. 1:8 or More	Percentage Serums Positive
Alabama	461	19	4.1
District of Columbia	114	-	-
Florida	210	1	.5
Georgia	502	30	5.9
Hawaii	9	1	11.1
Mississippi	88	1	1.1
North Carolina	240	1	.4
South Carolina	90	3	3.3
Tennessee	41	-	-
Total	1,755	56	3.2

TECHNICAL DEVELOPMENT BRANCH*

(This report presents results of work in progress and the conclusions reached may not be final. For this reason, the contents should not be published or referred to in articles for publication without permission. Reference in this report to any commercial materials or equipment does not in any

*Abstracted from Technical Development Branch Summary of Activities No. 27, July, August, and September 1951.

way constitute a recommendation of such materials or equipment by the U. S. Public Health Service.)

EQUIPMENT DEVELOPMENT

AIR-BORNE PATHOGENS STUDIES:

Refrigeration of Broth Containing Bacteria Collected with the Shipe Air Sampler. The development of automatic or semi-automatic samplers for air-borne bacteria has created a need for suspending bacterial multiplication during storage in the sampler prior to plating. Refrigeration of the samples at 12° C. has decreased the subsequent counting error considerably from that which occurred with nonrefrigerated samples. However, the counts of refrigerated samples were significantly lower than those of samples plated immediately after collection, indicating that a somewhat higher refrigeration temperature might be desirable.

The Retardation of Bacterial Multiplication on Incubated Nutrient Agar Plates by Means of Refrigeration. Tests were made to confirm the effectiveness of refrigeration at 8° C. in retarding bacterial multiplication on culture plates until such time as colony counts could be made. Such tests were considered desirable, since it is known that some organisms may multiply at refrigeration temperatures. Results of refrigeration for 24- and 48-hour periods indicated almost complete suppression of multiplication of colonies developed from atomized test organisms or those resulting from exposure to extramural air.

The Effect of Screen Covers on Open Sampling Plates. Insect contamination of open settling plates used in the air-sampling program at this station has created a major problem. After incubation, distinct paths of contamination on the culture medium may be observed following contact by insects. Therefore, screen-covered and unscreened culture plates were tested by exposing them to test organisms sprayed into the air with a hand-operated atomizer. Colony counts for screened plates were considerably lower than counts on the unscreened plates in all instances.

Investigation of the Contamination of Sieve Sampler Plates Prior to Operation. Bacterial colony counts showed that sieve sampler culture plates may be contaminated by handling and by the settling of air-borne bacteria through the perforations in the exposed sieve top.

CHEMICAL STUDIES

SYNERGISTS FOR DDT:

Fourteen compounds which have shown synergistic action of class I (greatest activity) were tested. Of these, p-chlorophenyl 1,2-dichloro-2 (p-chlorophenyl)-ethyl ketone shows the most promise.

SEPARATION OF DDT AND DDE FROM MIXTURES CONTAINING DMC AND DME:

Laboratory studies of the behavior of di(p-chlorophenyl) methyl carbinol (DMC) as a synergist with DDT have required a method of separating it from DDT and its degradation product, DDE, for analytical differentiation. Preliminary work has shown that the acid-celite column of Davidow is adaptable for this separation.

PURIFICATION OF TECHNICAL DMC:

The technical grade of DMC under test in this laboratory as a synergist for DDT was found to be too impure for more exacting tests of its synergistic behavior. Direct recrystallization of the material failed to provide a product of the desired purity. A vacuum fractional distillation was found to remove sufficient impurities to permit preparation of the pure compound by recrystallization from petroleum ether (Skellysolve B).

INSECTICIDE STUDIES

FLY RESISTANCE:

Studies on Possible Dieldrin Resistance in "Phaenicia pallescens." A repeat study* with colonies of *P. pallescens* exposed to various residual deposits of dieldrin has continued to show (a) some increase in dieldrin resistance in the F_1 and F_2 generation, (b) a lowered oviposition rate with the appearance of resistance, and (c) some loss of resistance in the F_3 generation.

Determination of Dieldrin Resistance in a "Musca domestica" strain from Charleston, W. Va. Charleston, W. Va., received dieldrin applications during the fly seasons of 1950 and 1951. Egg shipments of a strain of *M. domestica* from this city were submitted for dieldrin-resistant evaluation of the resulting adult flies. The flies were reared by standard techniques. The 48-hour mortalities of adults exposed for 30, 60, and 90 minutes to dieldrin deposits of 25 mg./sq. ft. were less than 6 percent in all cases, indicating a high dieldrin resistance.

Studies with Dieldrin-resistant Strains of "M. domestica" from the Pharr, Tex., Area. Moderate to fairly high dieldrin resistance has appeared in strains of house flies from four out of six Texas towns under experimental study. Three of the towns had received dieldrin treatments for

*See CDC Bulletin X(6): 41(1951) and X(9): 32-33(1951).

the past 2 or 3 years, the fourth town had not had any dieldrin applied as a fly control measure.

Determination of Insecticide Resistance in a "M. domestica" Strain from Yuma, Ariz. Adults of the F_7 generation of a dieldrin-resistant strain held free from residual deposits showed less resistance than the F_1 generation. The Yuma strain showed moderate susceptibility to DDT-DMC residual deposits.

Relative Effectiveness of Dilan and Its Components against Yuma and NAIDM* Strains of "M. domestica." Comparisons by topical applications showed no significant difference in the susceptibilities of the Yuma and the NAIDM strains to the nitropropane and nitrobutane fractions of Dilan, an application of 1.08 mg. per fly killing approximately 80 percent of the females of both strains. The chlorinated butane component of Dilan was equally effective against both strains over a range of dosages.

DEVELOPMENT OF FORMULATIONS FOR FLY CONTROL:

Comparison of Methods Used in Evaluating DDT Synergists against Resistant House Flies. Three methods for evaluating residual deposits were compared: (a) tests with flies confined in a petri dish over horizontal residual deposits; (b) tests with flies confined in a petri dish with the residual deposits in a vertical position; and (c) tests with flies confined in a standard test chamber with residual deposits on the four walls. With residual deposits of the same concentration, the highest mortalities were secured in the standard test chamber, and the lowest mortalities in the tests with the vertical residual deposits. Stimulation of fly activity by light, available treated resting surface, and contact between the residual deposits and the knocked-down flies were considered to be the controlling factors.

RELATIVE EFFECTIVENESS OF VARIOUS COMPOUNDS AS SYNERGISTS FOR DDT AGAINST RESISTANT STRAINS OF "M. DOMESTICA".

Combinations of *p*-Chlorophenyl 1, 2-di-chloro-2-(*p*-chlorophenyl)-ethyl Ketone with DDT. Although combined deposits of these two chemicals showed low effectiveness in initial tests made 1 week after application, marked improvement in effectiveness was shown in tests made 4 to 13 weeks after application.

Combinations of 1,1-bis(*p*-Chlorophenyl)-ethane with DDT. Only deposits of 200 mg. DDT:200 mg. synergist per square foot showed marked effectiveness for periods of 6 to 12 weeks. Deposits of DDT alone, and combinations of 200 mg. DDT:20 mg. synergist or 200 mg. DDT:40 mg. synergist, failed at the 6-week tests.

Combinations of x-Dichlorophenylethane with DDT. Only the 200 mg. DDT:200 mg. synergist per square foot deposits of this combination showed fair effectiveness against resistant house flies exposed for periods of 120 minutes. The other combinations, 200 mg. DDT:40 mg. synergist and 200 mg. DDT:20 mg. synergist were relatively ineffective.

Other Synergists Combined with DDT. Combined deposits of DDT with (a) a phenylmercuric salt of 2,4-pentanedione; (b) 2,4-dinitrosoresorcinol; (c) 1-ethyl-α-(3,4-dihydro-3, 6-dimethyl-2-phenyl-4-pyrimidylidene)-quinaldinium chloride; or (d) tetraethyldiamino-triphenylcarbhydride sulfate showed very little residual toxicity.

DDT-DMC Water-wettable Suspension Formulations. Suspension formulations of DDT-DMC water-wettable powders failed to increase the synergistic effectiveness of the combination over that from emulsion formulas or to extend the length of residual action.

Water-wettable-suspension Combinations of Hydroxypentamethyl Flavan and DDT. The addition of hydroxypentamethyl flavan did not materially improve the effectiveness of water-wettable DDT deposits against resistant house flies.

Water-wettable Combinations of 3-Hydroxy-2-naphthoic Acid and DDT. The addition of 3-hydroxy-2-naphthoic acid did not materially improve the effectiveness of water-wettable DDT deposits against resistant house flies.

Relative Effectiveness of Deposits from DDT-Xylene Emulsions Containing Various Emulsifiers. Using xylene concentrates containing 25 percent DDT and 2 percent of a candidate emulsifier (Antarox A601, Emcol H-77, or Triton X-155), finished 5 percent-DDT emulsions were applied to plywood, and the effectiveness of the residual deposits was checked after 4 weeks of either inside or outside weather. Deposits held inside were equal in effectiveness; deposits held outside indicated somewhat lower effectiveness from the Emcol H-77 formulation.

RELATIVE EFFECTIVENESS OF DILAN DEPOSITS FROM A WATER-WETTABLE POWDER AGAINST RESISTANT AND NORMAL STRAINS

*National Association of Insecticide and Disinfectant Manufacturers.

OF HOUSE FLIES:

Deposits from application of water-wettable Dilan suspensions have given 100 percent mortality of normal and resistant strains of house flies over a 3-week test period. In contrast, deposits from emulsion or solution applications continued to give very low mortality.

RELATIVE EFFECTIVENESS OF DEPOSITS FROM CHLORDAN FORMULATIONS WITH VARIOUS EMULSIFIERS AGAINST NORMAL "M. DOMESTICA":

The use of Antarox 14OH, Emcol H-77, or Triton X-155 as emulsifiers did not influence the effectiveness of chlordan deposits against normal flies. Mortalities were in excess of 85 percent in all cases.

DEVELOPMENT OF FORMULATIONS FOR DISINSECTIZATION OF AIRCRAFT:

Lindane Aerosol Formulations in Peet-Grady Chambers. Comparisons were made between the effectiveness of a standard aerosol G-382 and various experimental aerosols containing 0.5 percent lindane. Lindane used alone at 0.5 percent in an aerosol at 3 gm./1,000 cu. ft. of air showed a low performance of 0.67 as compared to 1.00 for the standard. The addition of 2 percent pyrethrum extract to the 0.5 percent lindane showed a performance equal to the standard. Further addition of 3 percent DDT gave a performance index of 1.1. Finally, addition of 1 percent MGK-264 and 0.5 percent piperonyl butoxide to the lindane-pyrethrum-DDT formula gave an index of 1.25. One percent lindane combined with 1 percent pyrethrum extract and 3 percent DDT gave a performance index of 1.49. Lindane alone at 1½ percent had an index of 1.50.

Residual Deposits of DDT from Wax Emulsions. Wax-emulsion formulations of DDT, without flammable solvents, have been developed for testing as hand-applied residues in aircraft and possibly in spray applications for field residuals. Laboratory tests have shown that this type of formulation will produce effective residuals. One formulation of the wax-emulsion type which has shown promise for residual deposits of DDT is WE-14, containing 5 percent DDT. In testing, a small amount of WE-14 was placed on a cloth and wiped on glass panels until the entire surface was covered with a thin film of wax. The dried wax film had very little tack and could be seen only by transmitted light. Tests were run on the deposits using an insectary strain of house flies confined over the film in a petri dish for 30 minutes.

The 24-hour mortality was 100 percent of the males and 94.5 percent of the females. In order to determine whether polishing of the waxed surface would affect its insecticidal qualities, the film was rubbed briskly with a dry cloth and the surface was retested. The film still showed high insecticidal activity and gave a 24-hour mortality of 98 percent of the males and 81.5 percent of the females.

PHYSIOLOGICAL AND BIOCHEMICAL INVESTIGATIONS WITH HOUSE FLIES:

Quantitative Inhibition by DMC of Dehydrohalogenation of DDT "in Vivo." Topical applications of varying amounts of DMC with a constant amount of DDT showed a direct relationship between inhibition of DDT-detoxification and mortality. Complete inhibition was not necessary for 100 percent mortality. By the use of chromatographic analysis, a high proportion of the DMC was shown to have penetrated the insect cuticle.

Determination of the DDT Pick-up by Resistant House Flies from Residual Deposits in Field and Laboratory Exposure. Flies were exposed to DDT residual deposits on glass for periods of 30 minutes, and analysis showed that significant amounts of DDT were absorbed.

Tests with field applications of 200 mg. DDT per square foot, applied as a DDT-xylene emulsion or as a water-wettable suspension, showed that flies caught in the treated dairy barns picked up less than 0.5 micrograms per fly and that 70 to 90 percent of the DDT was detoxified. Collections made 5, 8, 15, and 28 days after application showed little difference in the DDT pick-up from the two types of residual deposits.

Laboratory Studies on the Relative Susceptibility of Adult House Flies Reared from Eggs Collected on 6 Consecutive Egg-laying Days. No significant difference could be demonstrated in the susceptibility to DDT of adult flies of a resistant strain which were reared from eggs laid on the first to sixth egg-laying days in a study covering three generations.

Laboratory Studies on the Synergistic Effect of Various Fractions of Technical DMC in Combination with DDT against Resistant House Flies. After fractional distillation of technical DMC, the two fractions having the lowest melting points had more synergistic activity with DDT than did the higher melting point fractions.

STUDIES ON FLY HABITS:

Experimental Design for Study of the Relation-

ships between Grill Counts, Bait Trap Catches, and Population Levels of "M. domestica," "P. pallescens," and "Callitroga macellaria." In evaluating effects that sanitational, chemical, or biological control programs have on flies, efficient measurement and comparison of fly populations before and after operations are essential. Therefore, a study has been initiated to determine relationships between grill counts and four known populations of *M. domestica*, ranging from 200 to 12,800 considered alone and in various combinations with the flesh flies, *P. pallescens* and *C. macellaria*. Experiments have been conducted under four cage conditions involving malt-milk baits, garbage baits, and the effect of shrubs and shelters.

Average Number and Percentage of "M. domestica" Counted at Any One Time at Different Population Levels and under Different Cage Conditions. The average total counts at each population level showed that while the counts were higher at the higher population levels, the relative proportion of flies counted at each population level showed a progressive decrease as populations were increased. The over-all average percent of the population of *M. domestica* counted at one time was 8.0.

Effect of the Cage Conditions, Species Compositions, and Observers on Grill Counts. Analyses of variance on the various controlled factors of cage conditions, species compositions, and observers showed that the grill counts were markedly influenced by the different cage conditions, by the species compositions, and by the interaction of the two factors. Readings by the two observers were not significantly different. Break-down of the effect of changing various cage conditions showed that the substitution of garbage for some of the standard malt-milk baits materially increased the total grill counts. The presence or absence of the shrubs and shelters had no marked effect on grill counts of *M. domestica*. Species composition was largely confounded with time of day; but where no confounding occurred, the numbers of flesh flies did not affect the grill counts of house flies. Average grill counts taken in the forenoon were significantly lower than those taken in the afternoon.

CONTROL METHODS AND EVALUATION

BIONOMIC STUDIES:

House Fly Predominance in Dieldrin-treated Towns. House flies were found to make up almost one hundred percent of total flies observed following the May to June treatments in Elsa, La Villa, and Penitas, Tex. House fly proportions in the untreated check town (Edcouch) varied considerably throughout the study period, but remained much lower than in the dieldrin-treated towns.

House Fly Breeding in Pit Privies. Surveys in Elsa, La Villa, Penitas, and Edcouch, Tex., showed heavy house fly breeding in pit privies in treated towns. Relatively few privies were breeding flies in the untreated check town (Edcouch). A large number of house flies were found in privy pits and superstructures in the treated towns. Fly population indexes were relatively low in Edcouch, but were extremely high in the treated towns. No roaches were observed in Elsa and very few were seen in La Villa and Penitas, but a large number of privies in Edcouch contained sizeable roach populations. DDT and chlordan larviciding in Elsa privy pits has not controlled fly breeding.

Studies of Fly Resting Habits in the Pharr, Tex., Area. Ground surfaces continued to be the principal daytime resting places for house flies, *Phaenicia* spp., and *Sarcophagula* spp. Principal nighttime resting places for these species were grasses and weeds. Daytime locations for *Drosophila* spp. were garbage in containers and privy pits, and nighttime locations were privies and garbage in containers. The number of *Drosophila* observed was much less than in the previous quarter.

"Sarcophagula" Resting Habits in the Pharr, Tex., Area. A summary of *Sarcophagula* resting habits indicated a daytime preference for ground surfaces and vegetation. Almost all the flies observed at night were on grasses and weeds throughout the year. A marked change in night resting surfaces was noted in the first 6 months of 1951, as compared with the corresponding period in 1950. In this period, many more flies were found on tree trunks, fence wires, and slats than had been noted in previous months.

Fly Resting Habits in Elsa, Tex., Where Dieldrin Had Been Used. Resting habit studies in this dieldrin-treated town showed little change as compared to resting habits in untreated towns, although population pressures were much higher in Elsa. An increase in the number of flies resting in privy pits in the daytime was noted and is associated with intense house fly breeding in these locations. Almost the entire number of flies observed was *M. domestica*.

SANITATION STUDIES:

Relative Fly Populations in Three Sanitation Study Towns. Fly population indexes for Latin

sections of Pharr, Mission, and Edinburg, Tex., indicated a general increase to peak populations in July, followed by a general decline. A late August peak in Edinburg was attributed primarily to an influx of flies from a meat packing establishment just outside the city. Pharr (check town) indexes continued at the highest level. Mission indexes were more uniform than those of Edinburg. Indexes in Anglo sections in all towns continued at a very low level.

Surveys of Fly Attractants in the Pharr, Tex., Area. All Latin sections showed increases in the frequency of occurrence of fly attractants. Compared with the previous quarter, however, there were substantial decreases in total attractant areas in Latin sections of the three towns (Pharr, Mission, and Edinburg). Mission has practically eliminated animal pens from the city.

Evaluation of Sanitation Factors Affecting Fly Populations. The principal improvement in the three study towns of the Pharr, Tex., area was the reduction of scattered garbage in all sections. There was a general increase in disposal of refuse by scattering and piling.

Fly Attractants and Sanitation Factors in Business Sections, Pharr, Tex., Area. Except for a smaller total area of attractants, business sections were roughly equivalent to Latin residential sections in fly attractants.

Frequency of occurrence of approved garbage containers in business blocks was considerably lower than in corresponding Anglo or Latin sections.

Survey of Rodent Populations and Related Sanitation Factors. Principal rodent harborage types for Anglo sections in the Pharr, Tex., area were rubbish, openings under floors, and improperly stored goods. Harborage under privy floors and in privy pits was important in Latin sections. Harborage available was slightly reduced from last quarter.

Garbage in containers continued to be the principal food source for rodents with general increases in frequency. The second important source was stored food, particularly in business sections.

Principal active burrow and runway locations were under houses and in Latin privy pits. Much more burrowing activity was noted in Latin and business sections than in Anglo sections. Less burrowing was noted this quarter than last.

Most rodent infestations were light (1-5), with a few moderate (6-15) and one heavy infestation (16 or more). House mice and Norway rats predominated, and were found with about equal frequency.

Poison and traps were the most frequently used rodent control measures. Ratproofing was seldom employed. Proper sanitation as a rodent control measure was not observed.

CONTROL STUDIES:

Disinsectization of Aircraft. A limited number of experiments in aircraft in flight and on the ground indicated that hand aerosol applications and dispersal by an automatic disinsectization system were comparable in their effectiveness against free-flying insects. Under field test conditions, *Anopheles quadrimaculatus* were satisfactorily controlled with G–651, G–382, and S–83 at dosages of 2.5 to 8.2 gm./1,000 cu. ft. Results against house flies suggested a need for further tests.

Evaluation of Outdoor Space Spray Formulations. Tests with space spray formulations made on wild flies at the Savannah, Ga., city dump indicated: (1) House flies, *M. domestica*, were about as resistant to DDT as in previous years; (2) blowflies, *C. macellaria* and *P. pallescens*, had little or no resistance to the formulations tested; (3) an emulsion with a 5:1 ratio of DDT-chalcone showed definite promise as an effective insecticide against DDT-resistant house flies; and (4) DDT-DMC at ratios of 5:1, 10:1 and 20:1 were almost equally effective against DDT-resistant house flies.

Control of Fly Breeding in Garbage Cans by Larvicides. Garbage cans from Savannah, Ga., premises with suitable larval infestations were treated with dieldrin, chlordan, lindane, and technical BHC (12 percent gamma isomer) in 1950. Emergence ranged from 0 to 253 flies in untreated check cans and from 0 to 410 flies in treated cans. *M. domestica* was the dominant species. BHC was the most effective larvicide, though none of the treatments entirely prevented fly emergence. House flies emerged throughout a prolonged winter period of below freezing weather.

Fly Control at Savannah, Ga., Dairies Using a Small Space Spray Machine to Treat Nighttime Resting Places. Flies were readily brought under control at a small dairy using 5 percent DDT:1 percent DMC as a space spray emulsion applied to nighttime resting places with a small portable sprayer. It was a little more difficult to control

flies at an average size dairy. A large dairy with high fly potential was not brought under control, but it could have been with more intensive treatment. The method is considered very economical and will be studied further.

Residual Treatment of a Savannah, Ga., Dairy with DDT-DMC at a 1:1 Ratio for Fly Control. A residual treatment of a dairy with DDT-DMC failed to give satisfactory fly control, although there was a considerable reduction in the level of the fly population for several weeks after treatment.

City-wide Residual Application of DDT-DMC for Fly Control. After rapid fly increases followed dieldrin treatments in Penitas, Tex., a second complete treatment was made July 3-6 using 200:40:20 mg./sq. ft. of DDT-DMC-rosin residual. Fly populations were reduced during treatment, but they increased rapidly thereafter. Extensive house fly breeding in pit privies was discovered in August.

City-wide Residual Spraying of Daytime and Nighttime Fly Resting Places. Fly populations in Elsa and La Villa, Tex., rose rapidly to high levels soon after dieldrin residuals were applied in May. Daytime resting places in La Villa and nighttime resting places in Elsa had been treated with a 25 mg./sq. ft. dieldrin residual. Indexes in untreated Edcouch were much lower than in the treated towns. Flies in the treated towns were found to have dieldrin resistance. Extensive house fly breeding was noted in privy pits in both towns in August.

Fly Control by Selective Treatment of Classified City Blocks in the Pharr, Tex., Area. Selective treatment of classified blocks in San Juan with dieldrin gave comparatively low fly levels for about 6 weeks, then increased rapidly. Fly populations in untreated blocks and in blocks with limited treatment remained low, while indexes in blocks with complete treatment reached extremely high levels. Fly populations in untreated Pharr remained at comparatively low levels.

In Donna, principal daytime resting surfaces in classified blocks were treated with dieldrin at 25 mg./sq. ft. Fly population indexes remained at low levels for about 5 weeks, then rose rapidly.

Wall-cage Testing of Dieldrin Residues Applied for Fly Control in the Pharr, Tex., Area. Wall-cage tests with Pharr, Tex., flies (assumed to be resistant to DDT only) and locally trapped flies* exposed to selected surfaces showed initial high mortality that decreased as the insecticide residues aged. Fly populations in Donna and San Juan increased shortly after the wall-cage mortalities declined. All local strains showed lower mortalities than Pharr flies, indicating the development of dieldrin resistance. Weeds and tree foliage gave the highest kills in early posttreatment weeks, but in later weeks declined below those of wood surfaces.

Rat Penetration Tests on a Collapsible 55-Gal. Neoprene Storage Drum. Under severe test conditions, roof rats failed to penetrate a collapsible 55-gal. neoprene storage drum filled with shelled whole corn.

TOXICOLOGY

TOXICITY OF DIELDRIN:

LD_{50} for Dermally Applied Dieldrin to Rabbits. Dieldrin was applied dermally in a single application to 20 adult male and 40 adult female rabbits. The results with both sexes were combined because so few animals were used. The Chi-square of the line was 2.98, indicating a good fit, since Chi-square for 3 degrees of freedom and a probability of 0.05 is 7.82. The LD_{50} was 184 mg./kg., while the confidence limits of 19/20 probability were 243 and 139 mg./kg.

Tolerance to High Dosages of Dieldrin in White Rats Previously Exposed to Lower Concentrations of the Same Poison. Test rats were preconditioned by repeated exposure to small quantities of dieldrin and then were given a single large, challenge dosage using 25 percent concentrate at the rate of 400 mg./kg. The mortality among 51 males distributed in 10 experimental groups was 73 percent, and that among 50 females in 16 groups was 74 percent. Among the controls (not preconditioned), 56 males in 8 groups showed a mortality of 96 percent, while the mortality of 159 females in 17 groups was 97 percent. These results indicate that rats develop a small but definite tolerance to dieldrin through repeated small exposures to it. No explanation can be offered at this time for the persistence of tolerance and, in fact, for its apparent increase long after the series of preconditioning doses were discontinued.

PHYSIOLOGICAL STUDIES:

Effect of Subtotal Hepatectomy on Weight Loss

*Captured in each of the treated towns and exposed to surfaces in towns in which they were obtained.

and Liver Chemistry in the Dieldrin-poisoned Rat. Forty-eight hours following 70 percent hepatectomy, the experimental group (I) was given a single dermal application of 3.125 percent-dieldrin emulsion at the rate of 50 mg./kg. Paired feeding controls (group II) and controls given a full diet (group III) were treated in the same manner as group I, except that they received a control emulsion containing no dieldrin. The dieldrin-poisoned group showed about the same degree of liver restoration as did the starved controls, but slightly less than the fed controls. There was little difference between the percentage of lipid found in the livers of the three groups.

TOXICITY OF CHLORDAN:

Toxicity of Chlordan Vapors from Residual Deposits to Infant and Adult Sherman Albino Rats. The results of two additional spray periods are reported. As in the earlier tests, no increase in mortality was caused in adult or infant rats by exposure to chlordan vapors arising from a residual deposit. The experimental animals showed no change in the total number of white blood cells or in the differential count; the red cell count, hematocrit, and hemaglobin were also unchanged. Qualitative bio-assay indicated a slight chlordan storage in the liver and kidneys of the exposed animals. An insecticidal material in the kidneys of normal male rats was demonstrated. Pathological examination showed that 2 of 17 exposed females showed minimal changes in the liver, and 5 of 7 exposed males showed localized changes ranging from minimal to severe. Under the conditions of the experiment, the histological changes were not readily correlated either with the total duration of exposure or with the time after the last spray application. In general, the lesions, even in the males, were usually quite mild and required careful study for their discovery.

TOXICITY OF DDT:

Physiological Study of Liver Function and Tissue Pathology in Rats Following Prolonged Dermal Application of DDT. The bromsulphthalein (BSP) liver function test gave an average value of 0.99 mg. BSP per 100 ml. of plasma in 10 normal rats, and an average value of 2.04 mg. in 4 rats which had previously received 428 dermal applications of 2.5 percent-DDT emulsion at the rate of 40 mg./kg./day, 5 days per week. The experimental rats had been removed from exposure 14 to 35 days before testing. Pathological study revealed slight changes in the liver cells, but gave no evidence that these changes were irreversible.

Clinical Studies of DDT Storage Levels in Human Fat. Eighteen additional samples of human fat taken from elective surgery cases in Wenatchee, Wash., have been added to the study. The patients showed no signs or symptoms which might be attributed to DDT intoxication. The values for these samples and for those already reported from the Wenatchee area are similar to the values for the Savannah area. A striking phenomenon is the wide range of values (0 to 28 p.p.m. in this series) for persons with essentially identical histories of exposure. This phenomenon remains unexplained.

Effect on Rats of Oral Doses of DDT in Combination with a Chlorinated Chalcone, *p*-Chlorophenyl 1, 2-Dichloro-2-(*p*-chlorophenyl)-ethyl Ketone. Experiments on rats failed to demonstrate any clearly significant increase in the toxicity of DDT caused by combination with the chlorinated chalcone. No toxicity of the chlorinated chalcone alone was demonstrated under the conditions of the test.

TOXICITY OF PARATHION:

Study of the Pattern of Cholinesterase Depletion and Recovery Following Repeated Exposure to Parathion. A second cycle of parathion poisoning in dogs has been carried out. The response of the animals in the two cycles was generally similar. However, during the first postpoisoning period, the plasma cholinesterase reached, in each of the four cases, a level higher than its normal prepoisoning value. The comparative values ranged from 130 to 180 percent of the normal.

Sampling and Analysis of Air for Parathion. A study has been made of the methods by which parathion is applied and of the air concentrations of the compound which workers encounter under different circumstances. The mean of observed values on parathion air samples taken as closely as possible to the faces of workers during loading operations was 2.35 gamma/liter as compared to 0.50 gamma/liter during orchard spraying and 0.52 gamma/liter during mixing operations inside a commercial plant. Lower average values (0.23 and 0.19 gamma/liter) were obtained when samples were taken outside orchards or the mixing plant, respectively, during operations. It is not possible at this time to point out one method of application as having a greater over-all safety for the worker than another.

The Effects of Parathion on the Cholinesterase

Levels in the Blood of Spray Crews Operating in the Wenatchee Valley. An attempt was made during the spring and summer of 1951 to test a broad section of the exposed population of the Wenatchee, Wash., area in order to find whether exposed operators or members of the general population were affected by parathion. A partial analysis of the data shows numerous examples of cholinesterase depression. With certain interesting exceptions, a parallelism has been found between the presence of illness and cholinesterase depletion.

TOXICITY OF VARIOUS CHLORINATED HYDROCARBON AND ORGANIC PHOSPHORUS INSECTICIDES

LD_{50} Studies of Chlordan, Lindane, DDT, Methoxychlor, Toxaphene, Parathion, and Compound 4049 when Applied Dermally to Rats. The LD_{50} values for acute dermal applications of the following compounds to rats were: chlordan, 1,110; lindane, 500; DDT, 2,510; toxaphene, 2,300; and parathion, 10.9 mg./kg. It was not technically possible to apply enough methoxychlor or Compound 4049 dermally as an acute dose to demonstrate LD_{50} values.

TOXICITY OF 3-AMINOPHTHALHYDRAZIDE:

Effect of Single and Repeated Doses by Different Routes. At the request of the Genito-Urinary Service, U. S. Public Health Service Hospital, Staten Island, N. Y., a limited number of tests were made with 3-aminophthalhydrazide to evaluate its toxicity to experimental animals in connection with its potential use in renal function tests. Rabbits were given acute intravenous doses and rats were given acute intraperitoneal and oral doses and subacute oral doses. No LD_{50} value was determined because it was mechanically impossible to give a large enough dose. It was concluded that 3-aminophthalhydrazide possesses a very low order of toxicity.

CHEMICAL STUDIES:

A method has been devised for the synthesis of radioactive parathion using two radioisotopes, P^{32} and S^{35}. The radioactive parathion should facilitate analytical work in connection with toxicological studies of this compound.

TRAINING BRANCH

FIELD TRAINING

Table 1 shows the courses given by field training centers during the quarter.

Columbus, Ga. Thirteen trainees from other countries received individual training in environmental sanitation field training, water and sewage, or local health department activities.

Denver, Colo. Training activities included teaching environmental sanitation surveys, and mess sanitation to Air Force personnel at the University of Denver.

Pittsburgh, Pa. During the week of September 10, the Pittsburgh Center, in cooperation with the Pennsylvania Tuberculosis and Health Society, the Pittsburgh Department of Health, and the University of Pittsburgh, held a seminar on local health organization and administration for a group of 12 tuberculosis workers in Pennsylvania. The seminar was an outgrowth of a need felt by the tuberculosis societies in the Commonwealth for more information on factors which constitute good local public health services. The pre-seminar questionnaire, the pre-planning session for consultants, the informal luncheon for consultants and delegates, and the opportunity for delegates to plan together as to future use of information obtained were all considered of particular value. It was suggested that arrangements for field visits to local health units might also be of value for such a seminar.

Topeka, Kans. During the period July 17 to August 20, the staff members of this center assisted the Topeka City-Shawnee County Health Department in flood disaster relief work.

Initial draft of the 1952 recommended

Table 1

COURSES PRESENTED BY FIELD TRAINING CENTERS

Course	Type of Course	Location of Center	Duration (Weeks)	Dates (1951)	Students	
					Organizations Represented	Total
Environmental Sanitation	Regularly Scheduled	Amherst, Mass.	8	June 25 to Aug. 17	University of Massachusetts, U.S. Army, Virgin Islands	15
Insect and Rodent Control*	Special	Amherst, Mass.	1	Aug. 13-17	Yale University, State and local health departments	26
Insect and Rodent Control**	Special	Amherst, Mass.	1	Aug. 20-24	State and local health departments	18
Insect and Rodent Control***	Special	Amherst, Mass.	1	Aug. 27-31	State and local health departments	20
Milk Plant Sanitation Clinic	Special	Amherst, Mass.	1	Sept. 10-14	State and local health departments, Department of Agriculture, industry	15
Environmental Sanitation	Regularly Scheduled	Amherst, Mass.	12	Sept. 24 to Dec. 14	State and local health departments	10
Milk Sanitation	Regularly Scheduled	Bloomington, Ill.	4	July 30 to Aug. 24	Industry	3
Environmental Sanitation	Regularly Scheduled	Bloomington, Ill.	12	Sept. 10 to Dec. 1	State and local health departments	8 plus 2 part-time
Environmental Sanitation	Regularly Scheduled	Buffalo, N. Y.	12	Sept. 10 to Dec. 1	Local health departments	13
General Sanitary Engineering	Regularly Scheduled	Columbus, Ga.	12	June 18 to Sept. 7	Foreign governments, U.S. Public Health Service	6 plus 7 part-time
Environmental Sanitation	Regularly Scheduled	Columbus, Ga.	12	Sept. 24 to Dec. 15	State health departments, U.S. Public Health Service, and Foreign governments	16 plus 2 part-time
Milk Plant Sanitation	Special	Columbus, Ga.	1	July 23-27	District of Columbia Health Department	3
Milk Plant Sanitation	Special	Columbus, Ga.	1	Aug. 6-10	State and local health departments	3
Environmental Sanitation	Regularly Scheduled	Pittsburgh, Pa.	8	July 9 to Sept. 1	State and local health departments	7
Housing Sanitation	Special	Syracuse, N. Y.	1	Aug. 7-11	Virgin Islands Health Department	1
Housing Appraisal Method and Field Procedures†	Special	Syracuse, N. Y.	1	Aug. 13-18	Students from Erie County Health Department	7
Housing Sanitation†	Special	Syracuse, N. Y.	1	Aug. 20-25	Chief clerk of Buffalo Pilot Housing Survey	1
Environmental Sanitation	Regularly Scheduled	Topeka, Kans.	12	Aug. 27 to Nov. 17	Foreign governments, local health departments	5
Standardization of Milk Sanitation Rating Procedures	Special	Topeka, Kans.	1	Sept. 17-22	U. S. Public Health Service	18

*Held at Hartford, Conn., in cooperation with Training Branch, CDC, Atlanta, Ga.
**Held at Concord, N.H., in cooperation with Training Branch, CDC, Atlanta, Ga.
***Held at Providence, R.I., in cooperation with Training Branch, CDC, Atlanta, Ga.
†Held at Buffalo, N. Y.

Milk Ordinance and Code was completed in July. The draft was submitted to the Milk and Food Branch in Washington, D. C., and it is proposed to have the final draft in the hands of the Government Printing Office by December 1, 1951.

As requested by the officer in charge of the public health program on Indian

Reservations, plans are under way for the training of Indian sanitarians to begin January 1952.

Arrangements have been completed for holding the first course in disaster sanitation field training at Topeka, Kans., during the latter part of 1951.

STATE FIELD TRAINING (COOPERATIVE ENTERPRISES)

California. At the request of the San Diego Health Department, two 2-day field training courses in fly control were conducted during the period August 21-25. The courses were attended by 43 full-time and 17 part-time employees. Most of the trainees were sanitarians in the San Diego Health Department; the remainder were representatives of insect control units of various U. S. Navy installations in the area.

Arrangements have been made for a seminar on insect and rodent control procedures in food manufacturing plants to be conducted October 9, 10, and 11, and duplicated during the period October 23-25. The seminars will be held in the city of San Jose and Santa Clara County.

The closing of a popular, heavily used U. S. Forest due to insanitary conditions resulted in the re-examination of the various operational sanitation programs being conducted in the U. S. Forests in California. As soon as the details of the operational program for the future are formulated, a companion training program will be developed. Due to the seriousness of the problem now existing in U. S. Forests, the training of U. S. Forest personnel has been assigned a much higher priority in the program planning of the Environmental Sanitation training officer.

New York. The health educator training officer, Dr. Ruth Sumner, who has been stationed in Albany, N. Y., for 2 years, was transferred to the Atlanta office of Training Branch on September 28 to direct health educator field training.

Oklahoma. The field training of the four sanitarians and the six graduate students from Oklahoma University School of Public Health was completed on August 31. It is believed that this training has been particularly successful in certain phases of public health work that have not been included to any extent at other training stations. Two of these items are: (1) actual contact with the local health department personnel and actual assistance in carrying out of local public health problems; and (2) practice (two or three sessions a week) and training in speaking and public relations, and the actual use of this training by carrying on public health programs in this area at the request of the health officer.

At the request of the Oklahoma State Health Department, their four trainees and the training officer assigned to Oklahoma assisted the Ottawa County Health Department at Miami, Okla., which was partially flooded during the high water period. The trainees were assigned to and worked with regular members of the local and State health departments in the disaster area, thus obtaining good first-hand experience as to just what is expected of a local health department in time of emergency. The training officer went to the small town of Wyandotte, Okla., in answer to a request for emergency aid. Although Wyandotte had not been flooded, a brief report suggesting basic sanitation measures was submitted to the commissioner.

A rat eradication program was carried out during the week of July 16 in the City of Norman. The health officer promoted the program with cooperation from the Chamber of Commerce, Oklahoma University, Central State Hospital, and the City of Norman.

A 4-day foodhandlers school was conducted by the trainees during the week of August 6. The school for Cleveland County workers consisted of four 1¼-hour sessions, and approximately 150 foodhandlers attended the school.

A food school was also conducted on August 24 at Pauls Valley, Okla., for approximately 50 foodhandlers who will be working in the school lunch program in Garvin County during the coming year.

HEADQUARTERS TRAINING

Table 2 shows headquarters training courses presented during the quarter.

TRAINING PUBLIC HEALTH PERSONNEL FROM OTHER COUNTRIES:

Special observation and training pro-

Table 2

HEADQUARTERS TRAINING COURSES

Course	Type of Course	Duration (Weeks)	Dates (1951)	Students	
				Organizations Represented	Total
Fundamental Methods in Public Health Field Training	Regularly Scheduled	2	Sept. 14-28	Training Branch's Training Officers	8
Insect and Rodent Control	Regularly Scheduled	2	July 9-20	Air Force, foreign governments, local health departments	9
Insect and Rodent Control	Regularly Scheduled	2	Aug. 6-17	Public Health Service, foreign governments, State and local health departments	18
Rodent Control*	Special	1	Aug. 6-10	District of Columbia Health Department, Navy, General Services Administration, local health departments, and Public Building Service	19
Insect and Rodent Control**	Special	1	Aug. 13-17	State and local health departments, Yale University	26
Insect and Rodent Control***	Special	1	Aug. 20-24	State and local health departments	18
Insect and Rodent Control†	Special	1	Aug. 27-31	State and local health departments	20
Insect and Rodent Control††	Special	8 days	Sept. 10-19	Local health departments, Pest Control	76
Housing Sanitation†††	Special	1½ days	July 11-12	Trainees of Norman sanitation course, State health departments, schools of public health, and School of Planning	20
Housing Sanitation	Regularly Scheduled	5	Aug. 20 to Sept. 22	Local Health departments	2
Housing Sanitation+	Special	2 days	Sept. 4-5	Trainees of housing course in Atlanta and course at Columbus, and training officers of Columbus Center	10

*Held at Washington, D. C., in cooperation with CDC Regional Representative and District of Columbia Health Department.

**Held at Hartford, Conn., in cooperation with New England Field Training Center, CDC Regional Representative, and Connecticut State Department of Health.

***Held at Concord, N. H., in cooperation with New England Field Training Center, CDC Regional Representative, and New Hampshire State Health Department.

†Held at Providence, R. I., in cooperation with New England Field Training Center, CDC Regional Representative, and Rhode Island Department of Health.

††Held at St. Louis, Mo., in cooperation with the Topeka Field Training Center, CDC Regional Representative, and the Missouri Department of Public Health and Welfare.

†††Held at Norman, Okla., in cooperation with Norman Field Training Center.

+Held at Columbus, Ga.

grams were arranged for 17 public health workers from other countries who visited Training Branch. A breakdown is as follows: Angola, P.W.A. 1, Brazil 1, Ceylon 2, China 1, El Salvador 1, Egypt 1, Germany 1, Greece 1, Iran 1, Java 2, Norway 1, South Africa 1, and Thailand 3.

A 1-week program was arranged for two Public Health Service officers who will be assigned overseas under the ECA program.

Their program covered activities in Atlanta and in the Technical Development Branch in Savannah.

EXPANSION OF SERVICES:

Preliminary negotiations are under way for the establishment of field training activities in home accident prevention. A tentative meeting has been scheduled for this fall in Kalamazoo, Mich. Representatives of the Division of Sanitation, Kellogg Foundation, State Health Department, and Training Branch, CDC, will attend this meeting to discuss the development of field training activities in this field.

The Training Methods and Aids Section was placed in operation in August 1951. The workroom for conducting training classes and for conferences has been completed, and the first course was held during the quarter. A panel of consultants to aid in planning activities in training methods has been organized.

EVALUATION:

The administration of the preliminary form of the environmental sanitation achievement test to over 200 trainees was completed. Five regional field training centers and three State field training centers participated in the testing program. The item analysis is being made by the APHA State Merit System Service. It is hoped that the two comparable forms of the test for use as pretest and posttest will be ready for the January 1952 courses.

VETERINARY PUBLIC HEALTH BRANCH

RABIES

During the quarter, three human deaths from rabies were reported from two States. Indiana reported two cases, only one of which was confirmed by laboratory diagnosis. The third death was reported from Texas and was confirmed by laboratory findings.

For the first 9 months of calendar year 1951, there was a total of 5,482 cases of animal rabies reported to the National Office of Vital Statistics. This figure represents a 3 percent increase over the same period of calendar year 1950, but it is felt that this figure more accurately reflects the incidence of the disease, due to more prompt and accurate reporting from several of the States.

In the area of El Paso, Tex., the number of cases of animal rabies has continued to decline since a county-wide vaccination program was held in that area earlier in the year. Educational programs directed toward more rigid control of stray dogs are being developed in several of the large cities in southern and central Texas. Plans are being formulated for an intensive campaign for reducing fox and skunk populations in east Texas during the coming winter months.

Antirabies clinics with reduced fees were held in four counties in Indiana. The success of these mass immunization programs is determined by the interest, education, and publicity that precedes such a program. The most successful clinic held in Indiana was conducted in the county in which one of the human cases occurred.

In the State of Kentucky, where animal rabies has reached a very high peak, efforts are being made to develop county-wide rabies control programs. Mass immunization programs were conducted in four counties.

Mass immunization clinics were held in the various State and National parks in Colorado during the summer months. As a follow-up of the successful rabies program conducted in the Denver area early in 1950, not a single case of rabies was reported from that area during the quarter.

The State of Florida, which has reported

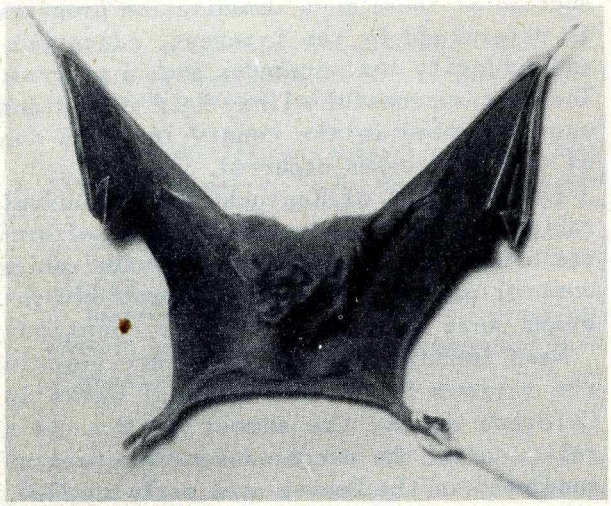
a limited amount of infection this calendar year, did not report a single case during the quarter. Eighty-one examinations of animal brains were made, but all were negative.

The rabies vaccination immunization studies being carried on at the Virus and Rickettsia Laboratory, CDC, Montgomery, Ala., are continuing. Blood specimens were collected for serum neutralization tests at the end of 18 months following vaccination. It is planned that these animals will be challenged at the end of 2 years after vaccination.

Infected vampire bats (*Desmodus rotundus*), important transmitters of paralytic rabies in Latin countries, have been reported as far north as Namiquipa in the state of Chihuahua, which is about 100 miles south of the Texas border. Vampire bat rabies costs thousands of dollars per year in losses to the agricultural economy of Mexico. Eight human rabies deaths caused by the bites of infected vampire bats have been reported thus far during 1951. Public health officials in the border States have been alerted to watch for the further spread of this disease.

SALMONELLOSIS

Studies on the incidence of salmonellosis in dogs being made in cooperation with the Florida State Board of Health are continuing, and plans are being formulated to include studies on the disease in swine.



Vampire bat — *Desmodus rotundus* — one of the smaller species of bats — the body is approximately 4 in. while the wingspread is approximately 13 in. Note rudimentary thumbs and long fingers connected by skin.

The examination of dairy cows was continued during July and August, resulting in 4 *Salmonella* isolations from 287 specimens. Two of these cultures were isolated from a cow that has remained positive since May.

After the examination of an additional 35 broilers in poultry processing plants with negative findings for *Salmonella*, this study was temporarily discontinued. It is planned to resume this work during the second quarter, Fiscal Year 1952, concentrating on older birds.

Bacteriological examination of 28 samples of fresh pork sausage obtained in retail markets by a dilution technique resulted in three positive specimens found by this method. All were negative by direct examination.

The study of salmonellosis in rats was continued through July. Cultures were obtained from 38 rats, resulting in 7.8 percent positive findings. It is of interest that the same *Salmonella* type was isolated from two rats trapped at the same grocery story 3 days apart.

Of 26 hens and young chickens received for examination for *Salmonella*, 5 hens yielded *Salmonella pullorum*. This organism was obtained from the culture of a cyst in the mesentery of one of these hens. Cultures from the heart, liver, spleen, gallbladder, oviduct, and intestinal contents from this bird were negative. Both *Salmonella typhimurium* and *Salmonella anatum* were isolated from two sick turkeys.

Q FEVER

The study of the pathogenesis of Q fever in cattle was continued at the Rocky Mountain Laboratory in Hamilton, Mont. Five additional cows were exposed to *Coxiella burnetii* by the inhalation of aerosol spray containing approximately 10,000 minimal infectious guinea pig doses. Three of the five cows had been used previously in transmission experiments and developed a slight rise in complement fixation titer against Q fever from the 13th to the 20th day, after which it receded. The two which had not been previously exposed to Q fever developed specific complement-fixing anti-

bodies against Q fever and are continuing to show rise in titer. Attempts to isolate Q fever rickettsiae from these cows were made, but to date tests are not complete.

As reported previously, six calves have been vaccinated with living Nine Mile rickettsiae. Feces and urine of these calves have been tested at monthly intervals since vaccination and have continually been free of *C. burnetii*. At 11 months post-vaccination, only one of these calves retained a complement-fixing titer for *C. burnetii*. Further tests will be made on them until they are challenged.

The survey for Q fever in Idaho sheep has been completed for this year. A total of 18 individuals who were associated in some manner with the sheep industry was found to possess antibodies for Q fever. Definite serologic evidence of infection in sheep was found on one ranch. This was a ranch on which four clinical human cases of Q fever occurred this spring. Low levels of complement-fixing antibodies against *C. burnetii* were found in sheep in other bands. However, at this time their significance cannot be evaluated.

During the study of Q fever in Idaho, a preliminary survey for possible infection in dairy cattle was initiated. One hundred and seventy-seven producer milk samples from herds located in the endemic area were tested by inoculation into guinea pigs. Further studies on this peculiar epidemiological situation are continuing.

Laboratory investigations into the resistance of *C. burnetii* to heat were continued at Davis, Calif. Data accumulated during this time indicate that the Henzerling strain of this rickettsia, when suspended in skim milk, will survive holding for 30 minutes at 144° F. when in concentrations of 1 million infectious guinea pig doses or more, and will survive 143° F. in concentrations of 100,000 infectious guinea pig doses. Thermal-resistance studies at these temperatures have been repeated several times. Demonstration of the presence of viable rickettsiae in the heated milk samples has been accomplished by serologic evidence in guinea pigs and by culture in developing chick embryos. Tests in which the organism was held at 142° F. have not yet been completed.

Five hundred samples of both raw and pasteurized milk have been collected from dairies throughout the State of California. This milk has been produced both in areas in which the disease in humans is endemic and in areas from which no cases of Q fever have been reported.

MEAT AND POULTRY HYGIENE

In Florida, Kentucky, and Colorado, educational, legislative, and advisory activities for the improvement, expansion, and standardization of meat and poultry sanitation and inspection facilities were increased. Included in these activities were surveys of local meat packing establishments, markets and facilities for carrying out adequate sanitation, and inspection facilities.

EASTERN EQUINE ENCEPHALOMYELITIS

The role of wild birds as a possible reservoir for E.E.E. virus is still being investigated. Known amounts of virus were inoculated subcutaneously; these amounts are calculated to be within the range of the amount a mosquito might introduce. The birds were bled twice daily and titrations of the blood were performed in mice. The studies included the white ibis, American egret, and snowy egret, all being approximately 5 to 6 months old. The viremia in the ibis reached a higher titer than that observed in the American egret, but was of a shorter duration. No symptoms or temperature rises were observed in the birds.

The role of the horse as a reservoir of the virus during epizootics is also under investigation.

VETERINARY PROGRAMS

North Carolina inaugurated a veterinary public health program with their own personnel. Indiana, a State to which a CDC veterinary officer had been assigned for the past few years, has now employed a public health veterinarian. Several other States have expressed interest in developing similar veterinary programs, and it is anticipated that these will be staffed in the near future.

CIVIL DEFENSE

Communicable Disease Center veterinary personnel has been assigned to the Federal

Civil Defense Agency in Washington, D.C., to assist in drafting plans and procedures relative to animal disease control and various phases of meat and dairy hygiene.

ANTHRAX

An epizootic of anthrax was reported among cattle in southwestern Kentucky and northwestern Tennessee during the month of July. At least one human case of this infection has been reported. A large outbreak occurred in Florida in October which involved hundreds of cattle. Five human cases were reported in veterinarians, cowboys, and laboratory workers. The epizootic was brought under control by extensive vaccination under the supervision of Florida authorities.

Recent Publications by CDC Personnel

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Menges, R. W., and Kintner, L. D.: Bovine Histoplasmosis. North Am. Vet. 32(10): 692-695 (1951).

Miles, V. I., Howitt, B. F., Gorrie, Rachael, and Cockburn, T. A.: Encephalitis in midwest V. Western equine encephalomyelitis virus recovered from mites *Dermanyssus americanus* Ewing. Proc. Soc. Exper. Biol. & Med. 77: 395-396 (1951).

Pratt, H. D.: *Ficalbia minima* (Theobald) in South Indochina, with descriptions of the larva and pupa (Diptera: Culicidae). J. Wash. Acad. Sci. 41(9): 300-302 (1951).

Prince, F. M. and Stark, H. E.: Four new fleas of the genus *Dactylopsylla* Jordan, 1929. Pan-Pac. Ent. 27(3): 128-139 (1951).

Sooter, C. A., Howitt, B. F., Gorrie, Rachael, and Cockburn, T. A.: Encephalitis in midwest IV. Western equine encephalomyelitis virus recovered from nestling wild birds in nature. Proc. Soc. Exper. Biol. & Med. 77: 393-394 (1951).

Tisdale, E. S.: A national program for training public health personnel. Pub. Health Rep. 66(42): 1361-1368 (1951).

Foreign Visitors To CDC

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

Dr. Guilio Buonomini, Director, Institute of Hygiene, University of Pisa, Pisa, Italy.

Mr. Riiti Kawakami, Chief, Department of Public Health Statistics, Institute of Public Health, Tokyo, Japan.

Dr. Takeo Matsui, Chief, Veterinary Public Health Department, Institute of Public Health, Tokyo, Japan.

Dr. H. F. Schiller, Chief, Division of Venereal Diseases, Pretoria, Union of South Africa.

Dr. Carlos L. Gonzalez, Director of Public Health, Caracas, Venezuela.

EPIDEMIC AND DISASTER AID

FRANK R. SHAW, Sanitary Engineer Director*

In the November 1950 issue of the CDC Bulletin there appeared an article on the subject of Epidemic and Disaster Aid. This article included the following:

Part I – Disaster Aid of Long Ago
Part II – A Natural Disaster at Texas City
Part III – The Northwest Flood

With the purpose in view of bringing readers of the CDC Bulletin up to date, a summary of Public Health Service participation in the recent flood disaster in Kansas and Missouri is presented here. The flood situation in Oklahoma was nominal and, therefore, CDC participation was limited to the furnishing of a small amount of insecticide and the loan of a few men then on duty in Oklahoma.

PART IV
THE MIDWEST FLOOD OF 1951

The general magnitude and seriousness of the recent flood in Kansas, Missouri, and Oklahoma is well known. This is crystallized in the statistics which appeared in an article in the September–October issue of "Military Engineer" by an Officer of the Corps of Engineers (see table 1). Few lives were lost, but the cost was obviously the greatest in the history of floods in this country.

Because of the stragetic location of the Federal Security Agency Regional Office at Kansas City, Mo., the Regional Medical Director was designated by the Surgeon General to act as Director of all Public Health Service disaster aid activities in the States of Kansas and Missouri, and CDC was directed to furnish assistance as requested to the limit of its facilities.

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The flood in Kansas became serious during the early part of July. Upon the request of the State Sanitary Engineer of Kansas, the 100 g.p.m. truck-mounted water purification unit and collapsible water tanks stored at Kansas City, Kans., under the care of the Office of Midwestern CDC Services (now Kansas City Field Station) were sent the night of July 11 to Ottawa, Kans., where the water plant had been inundated. This unit purified water for approximately 10,000 people during a period of 2 weeks. It is interesting to note that the difficulty of high turbidity of the raw water was overcome by mixing, coagulating, and settling in tanks prior to the passage of the water through the pressure filter. The mixing was accomplished by the use of an outboard motor. Without doubt, ingenuity has an important place in disaster aid.

Most of the sanitation activities in connection with a flood begin after the flood waters recede. The domestic water supply, however, is a noteworthy exception whenever it is affected. When the municipal water supply or the private well supply becomes inoperative, some steps must be taken immediately to provide a source for minimum needs, particularly drinking and culinary water needs. A second truck-mounted water purification unit and four collapsible tanks were transferred from Tyler, Tex., to the flood area on July 13. This served in the Mission area of Kansas City for a period of time. The low pressure in the Kansas City, Mo., municipal water system caused by the inundation of one pumping station and the loss of water through this part of the system led to the distribution of chlorine-impregnated tablets to the people through the medium of drug stores. Persons presenting a labeled envelope were given a small supply of the 8 mg. tablets, each one of which adequately disinfected a quart of water. When the stock pile of 5,000,000

Table 1

FIGURES INDICATING MAGNITUDE AND SERIOUSNESS OF 1951 FLOOD IN KANSAS, MISSOURI, AND OKLAHOMA

	Kansas	Missouri	Total
Acres Flooded	1,074,000	926,000	2,000,000
People Displaced	368,500	150,000	518,500
Major Bridges Lost	17	–	17
Railroad Rolling Stock Affected	22,100	65,000	87,100
Livestock Lost or Stranded	7,000	9,000	16,000
Flood Loss	$813,000,000	$177,000,000	$990,000,000

tablets at the Office of Midwestern CDC Services was nearing exhaustion, the Public Health Service Regional Engineer requisitioned additional supplies and 20,000,000 were flown in by Air Force planes from the four other stock-piling points, maintained by CDC. It is of interest to note that these tablets came originally from War Surplus and were given to CDC by the New York State Department of Education. Tests last spring of random samples revealed no loss of strength.

Post-flood sanitation includes, in addition to general clean-up and home rehabilitation, the restoration, cleaning, and disinfection of municipal and private

Table 2

EQUIPMENT FURNISHED BY CDC FROM STOCK PILES OR PURCHASE TO THE KANSAS – MISSOURI AREA

3	100 g.p.m. Truck-Mounted Water Purification Units
13	Collapsible Water Tanks
3	100 lb. Cl./day Emergency Chlorination Trailers
1	Motor Drying Unit Including a 25 kw. Generator
30	90 g.p.m. Dewatering Pumps
1	Power Driven Sewer Cleaner
1	L 40 Lawrence Aero Powered Mist Sprayer
1	L 80 Lawrence Aero Powered Mist Sprayer
1	Buffalo Sprayer-Duster
35	Perfection Hand Sprayers
32	Hudson Hand Sprayers
1	Hardy Powered Sprayer
1	Root Duster Converted to Power Sprayer
12	Light Traps
1	Block and Tackle and Well Jack
4	Tokheim Transfer Pumps
1	3/4 Ton Dodge Power Wagon with Winch and Cable on Front
141	**TOTAL UNITS**
9	1 1/2 Ton Trucks
19	1/2 Ton Trucks
2	Jeeps
2	Jeep Trailers, 2 Wheels
32	**TOTAL TRUCKS AND TRAILERS**

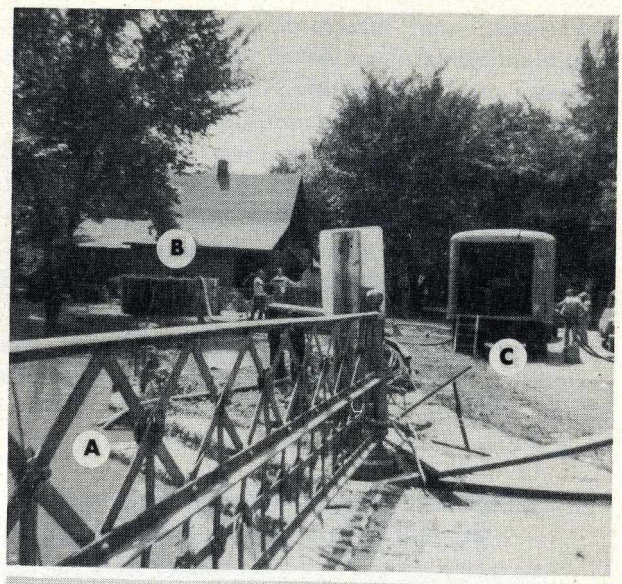
water supplies which were inundated; the unclogging of affected sewers; food sanitation; and mosquito, rodent, and fly control.

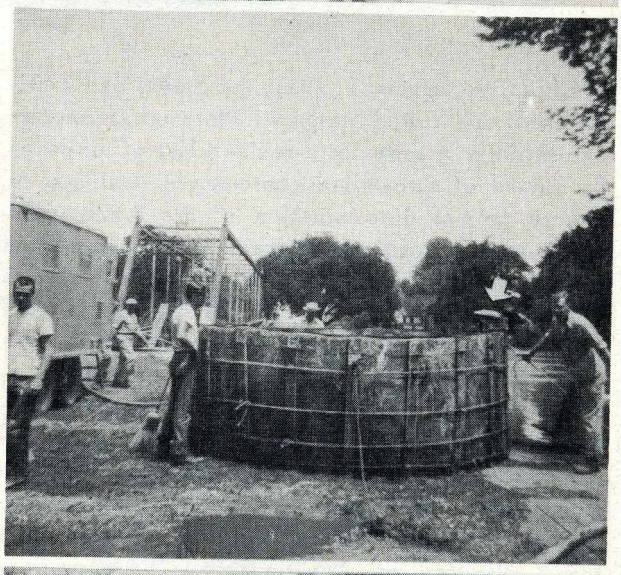
During the early stages of the flood, the Federal Security Agency Regional Office and CDC took steps to prepare to offer assistance if requested to do so by the State health officers. Because the need is immediate when it arises, equipment, supplies, personnel, and vehicles were moved to the area. The items of equipment and vehicles furnished are given in table 2. They include 141 units of equipment and 32 trucks and trailers. Supplies furnished included DDT, solvents, and insecticide formulations; chlorine products and tablets; and gasoline and oil for motor and motor vehicle operations. The personnel furnished, including those from Washington, D. C., Region VII, EHC, and CDC, but excluding the executive personnel at Kansas City and at Atlanta, was as follows:

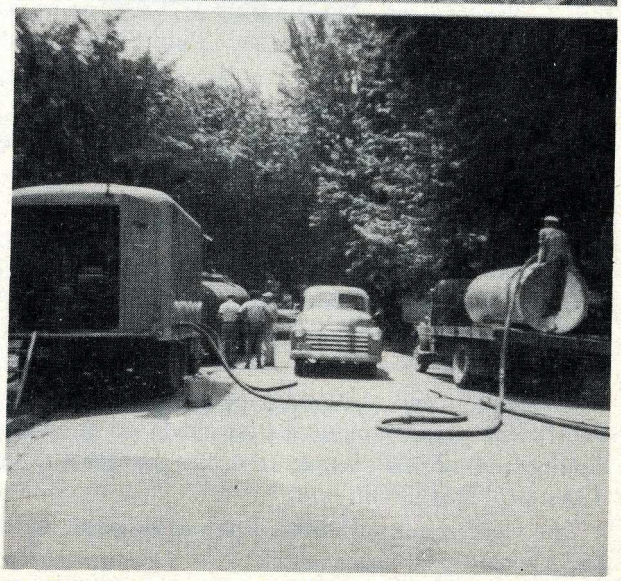
Sanitary Engineers	15
Sanitarians and Scientists	6
Entomologists	3
Malaria, Fly, and Rodent Specialists	18
Airplane Pilot	1
Total	43

As the normal activities of both Kansas and Missouri were under highly qualified and competent executive and technical direction, and district and local health services covered the States, the aid rendered by the Public Health Service consisted of supplementing that of the existing health departments, and was directed mostly toward the control of mosquitoes and flies.

These factors in environmental sanitation were magnified by (1) the existence of many areas of pooled water and temperatures favorable to mosquito breeding; and (2) the existence of large numbers of dead







TOP: Flow of raw water from river (A), through pump to coagulation and settling tank (B), thence to purification unit (C).

MIDDLE: Close-up of coagulation and settling tank showing outboard motor (arrow) used for agitating water.

BOTTOM: Transfer of purified water from purification unit to tank truck for delivery to residents.

animals, and quantities of putrefying meat and meat products, wet and decaying grain, and a favorable temperature for the breeding of flies and mosquitoes.

The services in these matters included advisory guidance of local personnel where an organized program existed, entomological survey and evaluation, estimation of need, and supervision of field operations where needed.

A very special entomological study was conducted in the River des Peres Valley in St. Louis, where outbreaks of encephalitis have occurred in the past.

In no case was personnel assigned or assistance rendered until requested by the State health officer.

The magnitude of the assistance rendered is reflected by the cost, which will total nearly $90,000. This cost does not include salaries, except in the cases of four temporarily employed persons.

NATIONAL MORBIDITY REPORTING - 1952

Effective January 1, 1952, the States and Territories of the United States will forward summaries of morbidity reports for a revised list of diseases by means of streamlined procedures designed to assure prompt dissemination of the information.

Inauguration of these changes was assured when the Association of State and Territorial Health Officers meeting in San Francisco at the annual convention of the American Public Health Association approved and endorsed the report and recommendations of the Subcommittee on National Morbidity Reporting, presented by Dr. Bruce Underwood, Chairman of the Infectious Diseases Committee. The same report, presented by the Subcommittee on National Morbidity Reporting of the Committee on Administrative Practice was approved by the American Public Health Association.

Thus, the Subcommittee on National Morbidity Reporting, consisting of five State epidemiologists and constituting a Subcommittee for the ASTHO, the APHA, and the Conference of State Epidemiologists, after more than a year's effort and with the assistance and consultation of State epidemiologists, laboratory directors, statisticians, U. S. Public Health Service consultants, and other well-known research workers in fields of epidemiology, microbiology, and statistics, prepared the way for fulfillment of a recommendation made at the 49th Conference of the Association of the State and Territorial Health Officers.

The Conference of State Epidemiologists, with Dr. Alexander D. Langmuir, CDC, as general chairman, and Dr. R. E. Serfling, also of CDC, as Executive Secretary, enunciated the broad principles governing the revision of the list of diseases and reporting procedures. The Conference, held in Atlanta last April under the sponsorship of the CDC and National Office of Vital Statistics, was conducted by the Subcommittee with Dr. A. C. Hollister as chairman. The tentative report of the Conference was forwarded to each State and Territory for comment, suggestion, and revision, and on September 26 when the Subcommittee gathered in Atlanta to write the final report and recommendations, replies had been received from 37 States, 2 independent cities, and 2 Territories. After study and consideration of the submitted comments, the final report was drafted for submission to the Association of State and Territorial Health Officers.

The revised reporting procedures provide for submission of weekly reports of State morbidity totals to the NOVS, and at the end of the calendar year, a corrected summary of these figures by months for the State, and by annual totals for each county. In addition, it was recommended for those diseases for which confirmatory laboratory tests are available, that a State total for the known number of laboratory-confirmed cases be reported. It was also recommended that a system be developed for reporting animal diseases which are transmissible to man.

The NOVS has prepared a manual of procedures which will be made available to all States, and which describes in detail the forms and procedures

which will be used to implement the revisions in national morbidity reporting.

In addition to Dr. Hollister, the Subcommittee included Dr. C. R. Freeble, Ohio; Dr. A. L. Gray, Mississippi; Dr. R. F. Korns, New York; and Dr. A. S. McCown, Virginia. Dr. Serfling was Executive Secretary, and consultants to the Subcommittee were Dr. C. C. Dauer, NOVS; Dr. Langmuir; Mr. F. M. Saybolt, New Jersey, and Miss Vivian Holland, Wisconsin, Chairman and former Chairman, respectively, Working Group on Morbidity Statistics of the Public Health Conference on Records and Statistics; Dr. T. J. Bauer and Dr. R. A. Anderson, Directors, respectively, Division of Venereal Disease and Division of Chronic Disease and Tuberculosis, U. S. Public Health Service.

The recommendations which were approved for implementation on January 1, 1952, follow:

RECOMMENDATIONS FOR REVISING NATIONAL MORBIDITY REPORTING

I. International Quarantine Agreement

An international quarantine agreement to which the United States is a signatory requires the immediate notification by telegram of the following diseases to the Surgeon General of the U. S. Public Health Service:

Cholera
Plague
Smallpox
Typhus fever, epidemic (louse-borne)
Yellow fever

II. Epidemic Reports

All outbreaks or unusual occurrences of communicable and other diseases of public health interest should be reported promptly to the U. S. Public Health Service. All such reports should be sent by or through the state health officer.

III. Weekly Summary of Notifiable Diseases

The total number of cases not previously reported for a minimum list of diseases (Table I), should be reported weekly to the Public Health Service by each state. Such reports are considered as provisional data, subject to further screening by all interested agencies.

IV. Annual Summary of Notifiable Diseases

A. Annual summary by calendar year should be made to the Public Health Service for an expanded list of diseases. (Table II.)

B. The annual summary should consist of the following tabulations:

1. State totals of cases not previously reported of the diseases in Table II by month, with specification of method of allocation to month according to one of the following:

   (a) Date of onset
   (b) Date of report
   (c) Date of receipt of report by local health office
   (d) Date of receipt of report by state health office
   (e) Other (Specify)

2. State totals of laboratory confirmed cases.

   The states should individually establish standards for acceptable laboratory confirmations for inclusion in these reports to the U. S. Public Health Service, recognizing the desirability of eventually achieving uniformity of these standards among the States.

3. Summarization of notifiable diseases by county of usual residence for each disease in Table II.

V. Venereal Diseases and Tuberculosis

The annual summary of notifiable diseases should contain tabulations of the number of Tuberculosis and Venereal Diseases cases. This does not affect the collection and distribution of certain data by the Tuberculosis* and Venereal Diseases Divisions of U. S. Public Health Service from states for purposes of program development or operational activities.

VI. Morbidity Reports from Cities

The Subcommittee notes that arrangements exist whereby weekly morbidity reports are furnished to the National Office of Vital Statistics by a selected list of cities throughout the United States. It is the consensus of the committee that this procedure should continue, but it recommends further study of the purposes and procedures for such reports.

VII. National Morbidity Reporting Procedures

The reporting procedures needed to implement the collection of the data described in the recommendations of the committee will be defined in a manual of morbidity reporting procedures prepared by the National Office of Vital Statistics. The draft of this manual has been prepared by the National Office of Vital Statistics with consultation from this Subcommittee, Communicable Disease Center, Venereal Diseases and Tuberculosis Divisions and the Working Group on Morbidity Statistics of the Public Health Conference on Records and Statistics. This manual should be distributed to all states and other appropriate agencies if and when the national morbidity reporting plan is approved by the Association of State and Territorial Health Officers.

VIII. Reporting Animal Diseases

Information as to the occurrence of certain animal diseases which may be transmitted to man is urgently needed for prevention of these diseases in man. Such information should be furnished by veterinarians and others through suitable channels for availability to local, state, and national health agencies. The threat of biological warfare adds to the urgency of developing this program, although the need for such a program has been apparent for many years.

*Now Division of Chronic Disease and Tuberculosis.

DISEASES RECOMMENDED FOR NATIONAL MORBIDITY REPORTING

Table I. Weekly Summary of Notifiable Diseases

Anthrax	Plague
Botulism	Poliomyelitis
Brucellosis	Rabies in man
Cholera	Rabies in animals
Dengue	Rocky Mountain spotted fever
Diphtheria	Smallpox
Infectious encephalitis	Streptococcal sore throat including scarlet fever
Infectious hepatitis, including serum hepatitis	Trichinosis
Malaria	Tularemia
Measles	Typhoid fever
Meningococcal meningitis and meningococcemia	Typhus fever, endemic
Pertussis (whooping cough)	Typhus fever, epidemic
	Yellow fever

Table II. Annual Summary of Notifiable Diseases*

Amebiasis	Q-fever
Anthrax	Rabies in man
Botulism	Rabies in animals
Brucellosis	Rocky Mountain spotted fever
Cholera	Salmonellosis
Dengue	Shigellosis
Diphtheria	Smallpox
Glanders	Streptococcal sore throat including scarlet fever
Infectious encephalitis (by etiology if known)	Tetanus
Infectious hepatitis, including serum hepatitis	Trachoma
Leprosy	Trichinosis
Leptospirosis	Tuberculosis (all forms)
Malaria	Tularemia
Measles	Typhoid fever
Meningococcal meningitis and meningococcemia	Typhus fever, endemic
Pertussis (whooping cough)	Typhus fever, epidemic
Plague	Yellow fever
Poliomyelitis	Venereal diseases
Paralytic	Chancroid
Non-paralytic	Gonorrhea
Unspecified	Granuloma inguinale
Psittacosis	Lymphogranuloma venereum
	Syphilis
	Primary and secondary
	All other

*All diseases for which laboratory confirmations are available are to be reported by (1) Total Cases, and (2) Total Laboratory confirmed cases.

A SURVEY TO DETERMINE THE PREVALENCE AND DISTRIBUTION OF TYPHUS IN RATS IN TEXAS

REUEL H. WALDROP, Sanitarian (R)* and LOUIS J. OGDEN, Sanitarian (R)**

INTRODUCTION

The problem of typhus control in Texas and in the Nation has been the concern of public health personnel for some years. In 1945, the Texas State Department of Health started an extensive typhus control program with operational policies based primarily on the incidence of murine typhus fever in humans. This program consisted of dusting rat runs and harborages with 10 percent DDT plus rat poisoning. Ratproofing was begun in a few cities prior to 1945. In this beginning year, a large protion of the 1,844*** human typhus cases

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***Data on the incidence of reported human typhus cases furnished by the Bureau of Vital Statistics, Texas State Department of Health.

was reported from the southern part of the State, but every section reported some cases.

During the first years of typhus control operations, human typhus cases were widespread and the rat populations were universally heavy. By carrying on typhus vector and rodent control programs in counties reporting the larger number of cases, and by operating mostly in the urban areas, the incidence of human cases was reduced from 1,844 cases in 1945 to 222 in 1950. Because of this 88 percent reduction of human cases, and in order to concentrate on the remaining scattered typhus foci, it was apparent that future control operations should be carefully planned.

OBJECTIVES

It was deemed desirable to secure more definite information about the accomplishments of 5 years of operations, as well as to obtain the necessary biological data to plan future typhus control operations. Surveys were accordingly planned in 1951 with two major objectives in mind: (1) to compare the 1946 and 1951 infection rates of murine typhus in rats trapped from certain selected counties;* and (2) to determine the extent and distribution of rats with typhus antibodies by certain premises categories and by climatical and geographical areas. The premises categories selected were: B_1—human food handling establishments; B_2—feed stores, grain houses, and warehouses; B_3—other businesses not handling food or feed, as well as residences and farms.

SURVEY OPERATIONS

The survey operational organization, as in the previous years, was as follows: (1) directed by the Texas State Department of Health; (2) laboratory work by the Texas Bureau of Laboratories; (3) promotion and field supervision by district engineers assisted by district supervisors; and (4) local operations carried on by State and local typhus control personnel.

In planning the operations for the two major objectives, it was decided to secure a minimum of one or more rats (later changed to two or more) from at least 50 well-distributed premises in each of the counties to be surveyed. Approximately 50 percent of the surveyed premises were to be located in urban areas and the other half in the rural areas of each county.

Since many urban typhus control programs were organized and local assistance was available, the accomplishment of urban evaluation work could be expected. However, with few local rural typhus control personnel to assist in the rural surveys, the idea of using high school agricultural students was successfully tried in Karnes County in December of 1950. The procedure used in conducting the rodent control and rat trapping project was later carried out on a State-wide basis. During the latter half of the 1950-51 school year, 45 different vocational agriculture classes comprising 2,060 students trapped 1,293 rats.

The 4-day typhus and rodent control training and trapping course was conducted as follows:

First day: Recognition of rat signs and live rat trapping was taught. Each student was assigned 15 steel rat traps at the close of the lecture and each boy started his individual 3-night trapping project at his or his neighbor's farm.

Second day: Rodent-borne diseases were discussed. Bleeding of rats, centrifuging the rat blood, and examination of the rats for ectoparasites were demonstrated to the students.

Third day: Lecture on methods of dusting rat runs and harborages to control rat fleas that transmit typhus, and also the principles of rat poisoning.

Fourth day: Antirat sanitation and ratproofing.

Teaching aids such as filmstrips, 16 mm. movie films, charts, and demonstrations were used extensively. The local vocational agriculture teacher and a representative of the State department of health conducted each of the classes. As a precautionary measure, each student dusted the trapped rats with DDT several minutes before handling. The trapped rats were then placed in containers (usually quart fruit jars), and were delivered each morning to the school building where the typhus control representative bled each rat, centrifuged the blood, and mailed the rat serum to the State laboratory to be tested for typhus complement-fixing antibodies.

COMPARISON OF THE 1946 AND 1951 RATES OF TYPHUS INFECTION IN RATS

To accomplish the first objective of comparing the typhus infection rate in rats in 1946 with that of 1951, eight counties were surveyed. The

*A limited amount of rat trapping was done in Texas during the latter part of 1945. The survey information secured during 1945 is included in the 1946 data for this paper.

A group of high school agricultural students watching a typhus control technician bleed rats which they had trapped from their farms. The 36 boys in this Future Farmers of America chapter trapped 80 rats in three nights.

Photo courtesy of Texas State Department of Health.

comparative findings are shown graphically in figure 1.

In 1946, rats from 495 premises were successfully tested from the eight survey counties represented in figure 1. Of these tested premises, 211, or 42 percent, were found to have rats with typhus antibodies. Five hundred and eighty premises in the same counties had rat serums successfully tested in 1951, and only 84 of these premises, or 14 percent, were found to have rats positive to the typhus complement fixation test. By comparing the 1946 typhus infection rate in rats with the 1951 rate, a 67 percent reduction was indicated for the 5-year period.

The 495 premises of the 1946 survey were represented by 1,165 successfully tested rat serums, or an average of 2.3 rats per premises. There were 908 rat bloods successfully tested from 580 premises in 1951, or an average of 1.5 rats per premises.

Since emphasis was placed on urban typhus control in Texas during the 5 years of operations, information from two cities located in two survey counties is given in more detail for illustrative purposes. Corpus Christi, Nueces County, has been selected as an example to show apparent progress in the reduction of the incidence of typhus in rats, while data from San Antonio, Bexar County, are given to show the lack of material reduction of the incidence of typhus in rats. Table 1 contains data concerning the surveys conducted in Corpus Christi.

In the statistics given in table 1, it is noted that 87 percent of the food establishments, 97 percent of the feed stores and warehouses, 72

FIGURE 1
PERCENTAGE OF PREMISES WITH TYPHUS POSITIVE RATS IN 1946 COMPARED WITH 1951

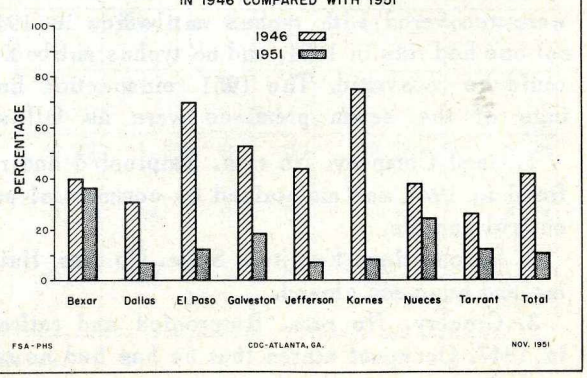


Table 1

TYPHUS INFECTION RATES FOUND IN RATS, AND OTHER SURVEY DATA FOR CORPUS CHRISTI, NUECES COUNTY, DURING THE YEARS 1946 AND 1951

	1946*					1951*				
	B_1**	B_2***	B_3†	Residences	Total	B_1	B_2	B_3	Residences	Total
No. of Premises Inspected	372	71	672	19,338	20,453	57	15	52	180	304
Premises Rat-Infested	323	69	485	1,211	2,088	6	2	1	5	14
% Premises Rat Infested	87%	97%	72%	6.3%	10%	11%	13%	2%	3%	5%
Premises Trapped	30	9	5	29	73	5	2	1	3	11
Premises Rat Serums Tested	15	5	1	16	37	5	2	1	3	11
Premises with Positive Rats	3	1	1	2	7	0	0	0	0	0
% of Premises Inspected with Positive Rats	0.8%	1.4%	0.15%	0.01%	0.03%	0	0	0	0	0
% of Rat-Infested Premises with Positive Rats	0.9%	1.4%	0.2%	0.17%	0.34%	0	0	0	0	0
% of Serums Tested Premises Positive	20%	20%	100%	12.5%	19%	0	0	0	0	0

*The breakdowns of business establishments are estimates.
**B_1 - Food Establishments.
***B_2 - Feed and Seed Stores, and Warehouses.
†B_3 - Other Businesses, Nonfood, Nonfeed, and Nonseed Houses.

percent of the nonfood and nonfeed stores, and 6.3 percent of the residences were rat-infested in 1946. During 1951, the premises inspections were made for evaluation purposes; thus the number of inspections was not nearly as large as for 1946. However, 304 premises that were most likely to be rat-infested were inspected and only 14 of these premises, or 4.6 percent, were found to have rats.

Nineteen percent of the tested premises in Corpus Christi had typhus positive rats in 1946, while none was found to have rats with typhus antibodies in 1951. It is questionable that typhus in rats was completely absent in Corpus Christi in 1951, but the reduction in the prevalence was further confirmed by the survey findings of those premises that were found to have positive rats in 1946. Of the seven premises from which rats were recovered with typhus antibodies in 1946, not one had rats in 1951, and no typhus antibodies could be recovered. The 1951 reinspection findings of the seven premises were as follows:

1. Seed Company. No rats. Ratproofed and ratfreed in 1947 and maintained by commercial pest control service.

2. Second Hand Furniture Store. No rats. Building and business closed.

3. Grocery. No rats. Ratproofed and ratfreed in 1947. Occupant states that he has had no rats since that time.

4. Tortilla Factory. No rats. Ratproofed in 1947 and has had commercial pest control service since that time.

5. Super Market. No rats. Corrected by replacing old building with a new, modern, brick, ratproofed building.

6. Residence, 700 block Alameda. No rats. Corrections made previous to 1951 by removal of chickens and feed from premises.

7. Residence, 3500 block Blue Bonnet. No rats. Corrected previous to 1951 by removal of chickens and feed from premises.

In general, the reduction of rats and of the prevalence of typhus in rats in Corpus Christi can be attributed to the following:

1. Semiannual DDT dusting of rat runs and harborages in rat-infested business buildings and annual DDT dusting in the residential area.

2. Ratproofing with emphasis on foodhandling establishments. Cafes and grocery stores were required to be ratproofed and ratfree in order to receive an annual permit to operate.

3. Rat reduction by poisoning in all business and residential establishments throughout the city.

4. All cafe and grocery store operators were strongly encouraged to continue using the services of the commercial pest control operator.

5. Antirat sanitation: Extensive phases of anti-

rat sanitation were carried on throughout the residential and business areas and the sanitary landfill method of garbage disposal was begun in 1946.

6. In 1948 an ordinance was passed regulating livestock and animals in the city. Difficulty of enforcement was encountered; nevertheless, apparent progress was made in reducing the rat population in the residential areas.

In brief, the policy followed in the business area of Corpus Christi was to initiate rodent control in all food establishments by ratproofing, rat poisoning, and antirat sanitation, followed by the eradication of rats from the neighboring nonfood establishments. In almost all areas where the food establishments were maintained ratfree, the rate of reinfestation of nonfood and nonfeed handling establishments with rats was very low.

The rural areas and the smaller towns of Nueces County did not conduct as extensive control during the 5 years as was conducted in Corpus Christi. Nueces County reported 59 human typhus cases in 1945 and only 9 cases in 1950. This is a reduction of 85 percent, but the remaining 15 percent can be expected to continue until an effective rural program is activated in Nueces County.

Cameron County, a coastal county similar to Nueces, has conducted an efficient rural typhus control program, and, therefore, its program can be used as a guide for planning rural typhus control work in Nueces County.

The Cameron County program was activated in 1947 with one man to do annual DDT dusting and rat poisoning of all rat-infested farms. In 1947, from a survey of 59 rural premises in Cameron County, 20 premises, or 34 percent of the farms tested, were found to have rats with typhus antibodies. In 1951, rat serums from 85 rural premises were tested and only five farms, or 6 percent, were found to have rats with typhus antibodies. This fact indicates that the typhus infection rate in rats was reduced 82 percent during the 4 years of continuous operations. It thus may be assumed from the Cameron County survey statistics that the prevalence of typhus in rural rats could be materially reduced in Nueces County by carrying on a similar program.

Data concerning the San Antonio surveys are given in table 2.

In table 2, it is shown that the results of the 1951 San Antonio survey were practically the same as in 1946. In 1951, 78 percent of the inspected premises were rat infested, while in 1946, 80 percent were infested. Of the 93 premises from which rat bloods were tested in 1946, rat serums from 37 premises, or 40 percent, were found with typhus complement-fixing antibodies. Of the 75 premises from which rat bloods were

Table 2

TYPHUS INFECTION RATES FOUND IN RATS, AND OTHER SURVEY DATA FOR SAN ANTONIO, BEXAR COUNTY, DURING THE YEARS 1946 AND 1951

	1946*					1951				
	B_1	B_2	B_3	Residences	Total	B_1	B_2	B_3	Residences	Total
No. Premises Inspected	730	111	350	4,229	5,420	707	100	300	3,817	4,924
Premises Rat Infested	271	77	170	3,789	4,307	207	66	150	3,411	3,834
% Premises Rat-Infested	37%	69%	49%	90%	80%	29%	66%	50%	89%	78%
Premises Trapped	53	5	22	181	261	33	0	4	46	83
Premises Rat Serums Tested	26	4	8	65	93	30	0	4	41	75
Premises with Positive Rats	8	0	0	29	37	11	0	0	18	29
% of Premises Inspected with Positive Rats	1%	0	0	0.7%	0.7%	1.6%	0	0	0.5%	0.6%
% of Rat-Infested Premises With Positive Rats	3%	0	0	0.8%	0.9%	5%	0	0	0.5%	0.8%
% of Serums Tested Premise: Premises Positive	31%	0	0	45%	40%	37%	0	0	44%	39%

*The breakdowns of business establishments are estimates.

tested in 1951, 39 percent were found to have rats with typhus antibodies.

Some of the rat control measures used in San Antonio were ratproofing in the central business district, rat poisoning in the municipal buildings and grounds, antirat inspection service in food establishments by sanitarians, and the application of rodenticides by commercial pest control operators.

The typhus vector control work in San Antonio largely consisted of one very complete cycle of DDT dusting of rat runs and harborages of the rat-infested business and residential premises in 1945-46. The dusting activity after 1946 was done primarily in business establishments, while the residential area was kept under surveillance for human typhus. Spot dusting was done in the immediate area where typhus cases had occurred. A question of policy prevented the local health unit from doing as extensive control in the residential area as was desired.

A large portion of the rat infestation and the incidence of typhus in rats was found to exist both years in the southwestern section of San Antonio adjacent to the central business district. This area consisted primarily of substandard residences with beer taverns, small grocery stores, and cafes interspersed among the small, poorly constructed, overcrowded homes. The insanitary conditions existing in this area were conducive to the propagation of rats.

In the 1946 San Antonio survey, there was an average of eight fleas of the species *Xenopsylla cheopis* recovered per rat, while in 1951 there was an average of two oriental rat fleas per rat. Of the premises from which rats were trapped in 1946, 40 percent yielded rats with *X. cheopis*, whereas 45 percent of the premises yielded rats with *X. cheopis* in 1951.

In 1946, there were 37 human cases of typhus fever reported from San Antonio, Bexar County, while in 1950 only 1 case was reported. The reduction was 97 percent in the number of reported human typhus cases, but due to the fact that 39 percent of the rat serums tested premises had typhus positive rats, with an average infestation of two *X. cheopis* per rat, it was apparent that conditions were existing in San Antonio which might cause an unlimited number of human cases to occur during 1951. As a result of the survey findings, extensive DDT dusting of the rat-infested premises throughout the substandard area was carried out. Rat poisoning with warfarin was also done in premises with heaviest rat infestations.

The survey findings in San Antonio support the thesis that sporadic DDT dusting will temporarily reduce the prevalence of typhus in humans, but rat control, including antirat sanitation, rat poisoning, and ratproofing, combined with an efficient DDT dusting program, are all necessary in the reduction of murine typhus in the rats.

THE DISTRIBUTION AND RATES OF TYPHUS INFECTION FOUND AMONG RATS IN 1951

To attain the second objective, namely, to determine the extent and distribution of rats with typhus antibodies, Texas was divided into four geographical zones which are described as follows:

Zone I, Coastal: All the counties adjacent to the Gulf of Mexico are included in this zone. The altitude in the counties varies from 0 to 200 ft.; the rainfall varies from 20 in. annually in the southern portion to 50 in. in the east; the relative humidity usually averages about 70 percent; and the average temperature is 69° F. Agricultural activities in this area include vegetable raising by irrigation in the south; cotton, grain, and cattle raising in the central counties; and rice farming in the eastern counties.

Zone II, Inter-Coastal Plains: This zone includes a wide section of counties extending from southwest to northeast. The altitude varies from 50 to 1,500 ft.; the rainfall, from 20 in. in the south to 50 in. in the east; the relative humidity averages 66 percent; and the temperature average is 67° F. Agricultural activities through this section consist largely of raising cotton, small grain, corn, cattle, and hogs.

Zone III, North Central Plains: This area is northwest of the Burnet-Llano Hill country near Austin, and extends to the Great Plains. The altitude varies from 900 to 2,600 ft.; the rainfall is 10 to 30 in.; the relative humidity averages 60 percent; and the temperature average is 65° F. Cattle grazing is the predominant agricultural activity with some farming, mostly in the northern section.

Zone IV, El Paso and Great Plains: This area comprises the most western and northern sections of the State. The altitude varies from 3,000 to 7,100 ft.; the rainfall is 10 to 25 in.; the relative humidity averages 48 percent and the average temperature is 58° F. Agricultural activities include cattle grazing and raising of cotton and small grain.

during the extremely dry and hot summer months and additional data is needed before reliable conclusions can be made.

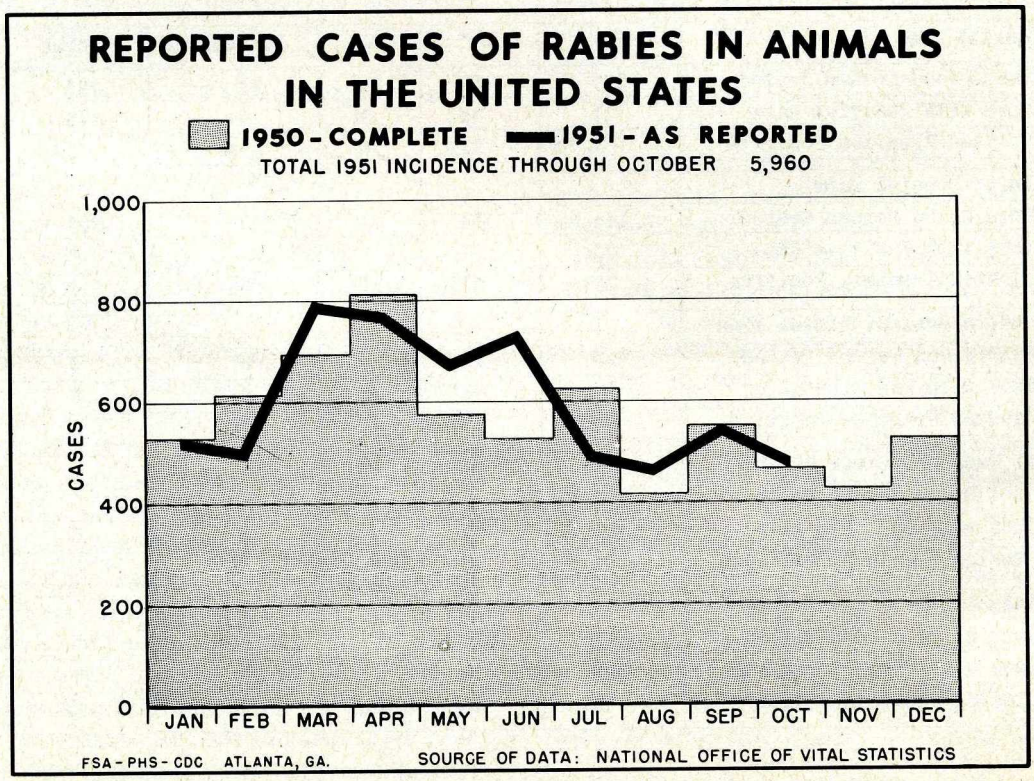
SUMMARY

The objectives of this paper, as stated at the beginning, were twofold: (1) To compare the 1946 murine typhus infection rate in rats found in Texas with the 1951 rate; and (2) To determine the extent and distribution of rats having typhus antibodies according to certain premises categories by climatical and geographical areas. The survey work was accomplished by Texas CDC personnel, local typhus control personnel, and the Future Farmers of America.

In comparing the 1946 and 1951 typhus infection rates in rats in Texas, eight counties were included in the survey. In 1946, 42 percent of the premises from which rat serums were tested had one or more rats with typhus antibodies, whereas in 1951, only 14 percent of similar premises were found to have positive rats. No county survey failed to show a reduction in typhus prevalence. Karnes County was shown to have the highest typhus infection rate in rats in 1946, but this rate was reduced from 75 percent in 1946 to 8.7 percent in 1951, a reduction of 88 percent.

In comparing the two surveys, it is shown that the reduction of the prevalence of typhus in rats was much more noticeable in counties or areas where different phases of extensive rat control were carried on in addition to 10 percent DDT dusting.

To determine the 1951 typhus infection rate in rats, the State was divided into four geographical areas and from 4 to 19 counties were surveyed in each zone. In Zone I, which contained the counties adjacent to the Gulf of Mexico, 12 percent of all types of urban and rural establishments were found to have rats with typhus antibodies. A major portion of the State's rural rat typhus was found existing in this zone. Typhus rat reservoirs were found in all types of urban and rural premises in Zone II, which comprises approximately half of the southern inland portion of the State. Thirteen percent of the premises surveyed had typhus positive rats. In Zones III (North Central) and IV (El Paso and Great Plains) combined, only three premises were found to have rats with typhus complement fixation antibodies, and the titers were low in all cases.



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ANNOUNCEMENT

In January of 1952 the CDC BULLETIN will be merged with two other technical periodicals of the Public Health Service. The material previously covered in these publications will be embodied in the new and expanded monthly version of PUBLIC HEALTH REPORTS. The merger has come about as the result of an extended study of the Public Health Service's publishing activities.

The new journal is designed to carry out more efficiently and economically the Public Health Service's responsibilities for disseminating scientific information on matters of health.

The new PUBLIC HEALTH REPORTS will be concerned with the technical and professional aspects of public health practice, with problems of health administration, and with research in these fields. It will include, as well, substantially the same kind of material that has been appearing in the CDC BULLETIN. The quarterly "Center Highlights" material, however, will be published separately as CDC PROGRESS REPORT.

As has been true with the BULLETIN, the pages of the new PUBLIC HEALTH REPORTS will be open, on merit, to any responsible author. General editorial guidance will be provided by a Board of Editors composed of individuals of recognized competence and professional stature drawn from both within and outside the Federal service.

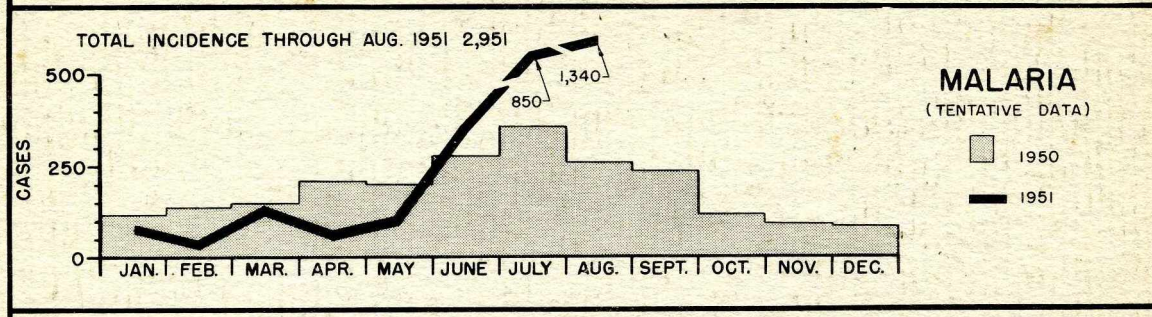
Every effort will be made to furnish the new PUBLIC HEALTH REPORTS to representative organizations in public health and its related fields. Most of the readers on the mailing list are affiliated with organizations to which free distribution can legally be made. They will continue to receive the new journal either directly or through these organizations.

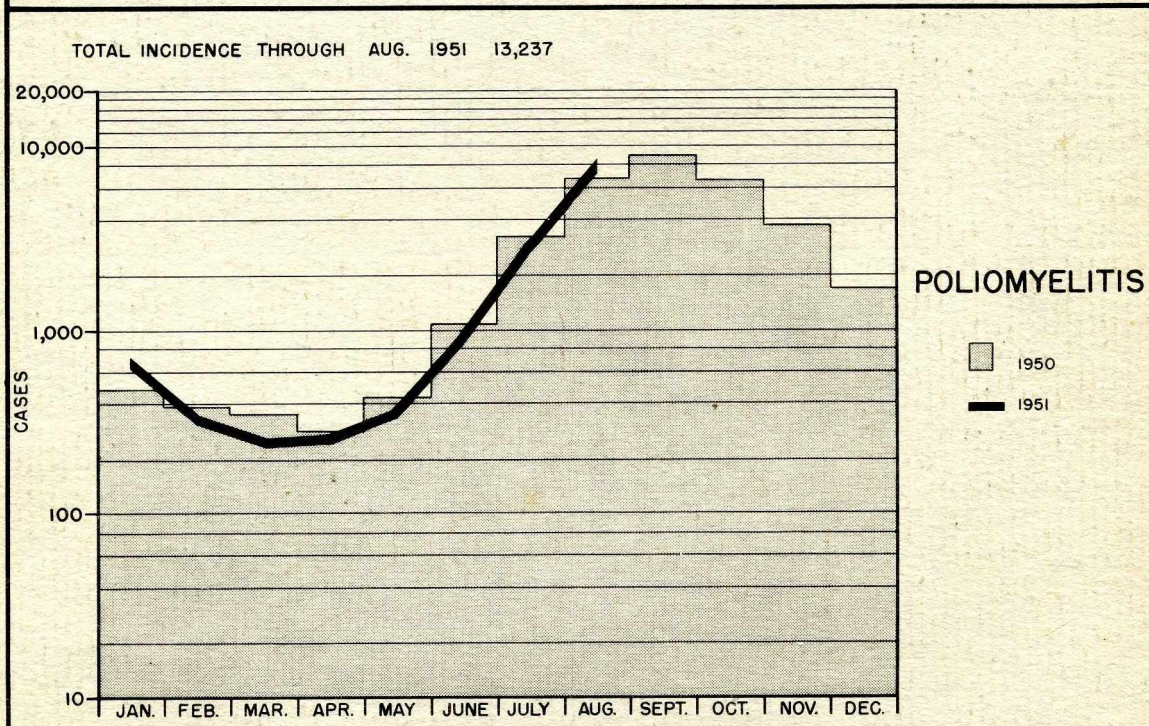
The first issue of the new PUBLIC HEALTH REPORTS and an application form for a free subscription will be sent to readers now on the free lists for technical periodicals. After they have had an opportunity to review the new PUBLIC HEALTH REPORTS and to consider its usefulness in their work, readers who wish to remain on the lists and receive the new periodical regularly should complete the application and send it in as soon as possible. This will allow time to revise the lists for mailing the second and subsequent issues.

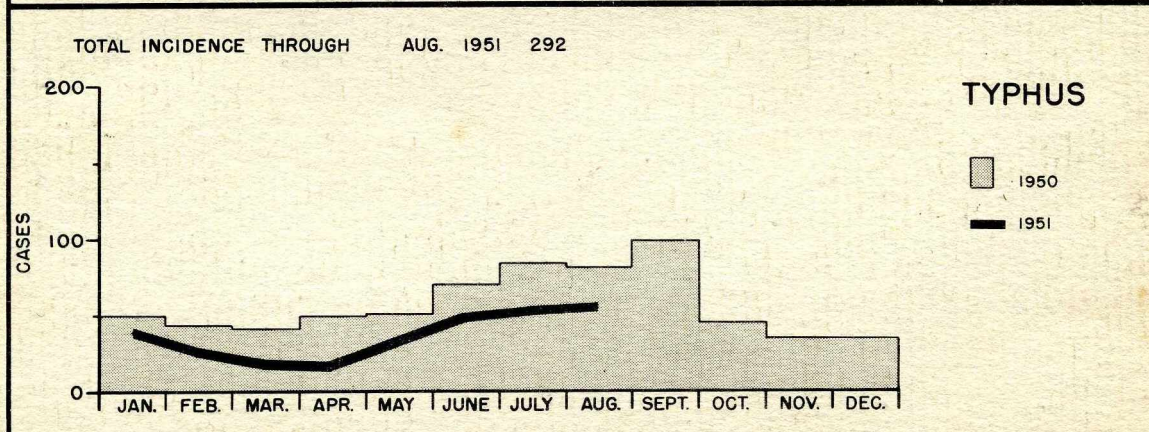
The new PUBLIC HEALTH REPORTS will also be available by paid subscription from the Superintendent of Documents, Government Printing Office.

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

1950 - COMPLETE 1951 - AS REPORTED







FSA-PHS-CDC ATLANTA, GA.

*SOURCE OF DATA: NATIONAL OFFICE OF VITAL STATISTICS