REVIEWS AND ABSTRACTS

BIOTIN AND FAT-SOLUBLE MATERIALS WITH BIOTIN ACTIVITY IN THE NUTRITION OF MOSQUITO LARVAE. By W. Trager. J. Biol. Chem. 176(3): 1211–1223. 1948.

The growth and metamorphosis to the adult stage of *Aedes aegypti* larvae free of microorganisms in a liquid medium of essentially known composition was studied. This medium, differing only slightly from that which had been used in nutrition studies of the fruit-fly, *Drosophila melanogaster*, (Schultz et al, Anat. Rec. *96*, 44, 1946; Villee and Bissel, J. Biol. Chem. *172*, 59, 1948) contained inorganic salts, ribose nucleic acid, cholesterol, sucrose, L-cysteine, glutathione, choline chloride, all the known B vitamins save biotin, and vitamin-free casein.

Optimum growth of the larvae, as determined by the rapidity of passage through the 4 instars, was obtained when the medium was supplemented with sufficient biotin to contain about 50 mγ (1 mγ equals 10^{-9} gm.) of biotin per milliliter. With lower biotin concentrations, growth was progressively slower. When the concentration of biotin was less than 5 mγ per ml., metamorphosis to the adult did not take place.

Biotin could not be replaced by pimelic acid, which serves as a precursor of this vitamin in the nutrition of the flour beetle, *Tribolium confusum*. However, relatively low concentrations of oleic acid, an oil from hydrolyzed horse plasma (FSF), lecithin, Tween 80 (a polyoxyethylene derivative of sorbitan monooleate), and Tween 40 (a polyoxyethylene derivative of sorbitan monopalmitate) could be substituted for biotin. Since these compounds can at least partially replace biotin, the author suggests that biotin must be of general importance in the synthesis of these lipides.

Further studies of the nutrition of mosquitoes may throw additional light on the role certain dietary essentials play in the metabolic processes of higher animals.—E. S. Josephson, Biochemist, National Institutes of Health, Bethesda, Md.

NOTAS SOBRE A DISTRIBUÇAO E A BIOLOGIA DOS ANOFELINOS DAS REGIAOS NORDESTINA E AMAZONIA DO BRASIL. Deane, L. M., Causey, O. R., and Deane, M. P. 1948. Rev. Serv. Esp. Saude Publ. 1:827–965. This paper is a summary of extensive observations on the anopheline mosquitoes of the Northwest and Amazon regions of Brazil, which were made from 1939–1944. The studies were initiated by the Laboratorio do Servico de Malaria do Nordeste, during the anti-*gambiae* campaign, and after the disappearance of this mosquito at the end of 1940, the program was expanded to include the other anophelines.

Thirty-six species of anophelines were collected. The distribution, seasonal abundance, larval ecology, feeding and resting habits of the adults, and the relation to malaria of each species are described. *Anopheles darlingi* is the most important malaria vector in this region. The distribution of the disease coincides closely with that of *darlingi*, except in certain coastal areas where *A. aquasalis* and *A. albitarsis domesticus* are involved in its transmission. Two varieties of *albitarsis* are recognized: var. *domesticus* is found in houses, while the typical variety prefers to feed on domestic animals and does not take part in malaria transmission. It is suspected that *A. pessoai* Galvao and Lane is a synomym of *A. brasiliensis* Chagas.

Tables are given of the numbers of adults and larvae taken in various localities by several methods of capture. The extent of the work can be appreciated when one notes that totals of 239,787 adults and 920,851 larvae were identified. There is also a table showing the numbers of mosquitoes examined for malaria parasites. *A. darlingi* showed a 1.8 per cent infection in 1600 examined; 0.9 per cent of 1364 *A. aquasalis* and 0.1 per cent of 1508 *A. albitarsis* were also infected. A single infected *A. pessoai* was found among 334 dissected.

Spot maps showing the distribution of all species are included, as well as graphs showing the daily activities of *A. darlingi, albitarsis,* and *aquasalis*.

It is the opinion of the reviewer that this is a valuable contribution to the literature of the Neotropical anophelines. Much of the information has been published elsewhere by the authors, but in this paper one finds a concise summary of the distribution and habits of these important mosquitoes in northern Brazil.—Lloyd E. Rozeboom.

MALARIA IN UTAH. By H. L. Marshall and Don M. Rees. Rocky Mountain Medical Journal 45(6): 469–472, 1948. Although Utah is usually considered to be a malaria-free state, this disease apparently has existed there for over 100 years. From 1900 to 1943 few cases of malaria appear on the records and of these, most of the patients seem to have been newcomers or travellers. During 1942 Utah reported 5 cases of malaria but in 1943, 313 cases were recorded. Even though 30 other states had a rise in malaria during the war years, not one had such a phenomenal increase as Utah. The chief factor in this rise was undoubtedly due to the return of the veterans from World War II. However, since that time there has been a steady decline in malaria and by 1947 only 47 cases were recorded for that year.

Both *vivax* and *falciparum* have been reported from Utah. The malaria vectors found in the state include *Anopheles freeborni* Aitken, found there below a level of 7500 feet, and *A. pseudopunctipennis franciscanus* McCracken. Apparently

all the factors aiding in the spread of malaria are not present in that state, yet the authors suggest the need for mosquito control.—Helen Sollers, (U.S.B.E.P.Q.)

THE DEVELOPMENT OF A SPRAYER FOR USE WITH WATER SUSPENSIONS OF DDT IN RURAL AREAS OF LATIN AMERICA. By Harold Trapido. Am. J. Trop. Med. 28(5):721–739. 1948. The importance of the use of DDT water suspensions, as contrasted with emulsions or solutions, is outlined from the point of view of logistics of supply, economy, and superior results obtained on earthen wall surfaces commonly encountered in Latin America and elsewhere in the tropics. The need in this area for a simple hand-operated apparatus to dispense water suspensions of DDT, rather than motor-driven equipment, is justified.

The development of a knapsack-type hand-pumped sprayer for use with DDT water suspensions is reported. The basic unit modified for this purpose is the Army item of issue, "Sprayer, Insect, Knapsack Type, Lofstrand Model." The important feature of the new unit is the large capacity filter of #40 wire-screen placed on the end of the outlet pipe where it is protected inside the body of the tank, yet available for cleaning each time the tank is opened for refilling with insecticide. The filter is constructed so that no particles can enter the hose which will either plug the nozzle or cause the gun valve to stick; yet the filter has sufficient capacity not to become plugged itself in evacuating a tankful of DDT mixture.

The sprayer is fitted with interchangeable air-relief valves, one of which may also be used to secure pressure in the tank from a compressed air source, where such is available. With each group of sprayers used by a field crew there is a combination stand-pipe, funnel, and preliminary filter. This provides for the filling of sprayers to a standard level, and reduces wastage in filling the tanks.—Author's summary.

A TEXTBOOK OF ENTOMOLOGY. Ross, H. H. 522 pp., 434 figures. John Wiley & Sons, Inc., New York, 1948. $6.00. The author has prepared a new introductory textbook of entomology which emphasizes the fundamental aspects of the science. Basic principles have been presented rather than detailed information. The first chapter discusses the growth of North American entomology in an interesting fashion; the second deals with arthropoda: insects and their allies—actually most of the space is devoted to arthropods other than insects; the third includes external anatomy; the fourth internal anatomy; the fifth covers physiology in a rather complete manner; the sixth is entitled the life cycle; and the seventh which extends over 200 pages is devoted to the orders of insects—this chapter contains keys to the orders of common insects and under the important orders keys to common families are provided. Condensed within this chapter are important data concerning the most common species or those of economic concern. Chapter eight deals with the geological history of insects: chapter nine with ecological considerations; and chapter ten with control considerations.

The author has presented a book which should adequately serve the needs of beginning students in entomology. It is attractively illustrated with 434 figures, the majority of which are borrowed but both the drawings and photographs are excellently reproduced. Few references are provided in connection with the individual chapters. The review has noted few discrepancies; Comstock initiated teaching of entomology at Cornell in the spring term of 1872; the use of the generic term *Bacillus* on page 493 is antiquated; in discussing the feeding habits of Mallophaga no reference is made to the fact that certain species obtain blood by puncturing the bases of young feathers.

The author is to be congratulated upon the appearance of this textbook which should find ready acceptance in beginning university courses in entomology.—E. Harold Hinman, The University of Oklahoma, Norman, Okla.

MALARIA, FILARIASIS AND YELLOW FEVER IN BRITISH GUIANA. CONTROL BY RESIDUAL DDT METHODS WITH SPECIAL REFERENCE TO PROGRESS MADE IN ERADICATING *A. Darlingi* AND *Aedes Aegypti* FROM THE SETTLED COASTLANDS. By George Giglioli, Mosquito Control Service, Medical Department, Georgetown, Demerara, British Guiana. 226 pp. 1948. Although this monograph will undoubtedly serve as an excellent guide and reference book to mosquito control workers in tropical countries, it is to me mainly an historical marker of the good that can be accomplished in controlling such outstanding health problems as malaria, filariasis, and yellow fever by means of DDT. Dr. Giglioli has recorded in considerable detail three years of research and practical experience with this insecticide. These pioneer investigations were begun in British Guiana in February 1945. I am particularly impressed by the author's optimism in the eradication of *Aedes aegypti* from 200 miles of treated areas after reflecting on our own "attempts" at ousting this mosquito from Florida. I know of no other report which covers control measures for malaria, filariasis and yellow fever by means of DDT residues alone. In fact, emphasis is laid on the fact that hydrological conditions have been ignored and remain as they always have been in the past. All of this is a fine tribute to an excellent project ably directed under difficult conditions of economy and geography. The book is divided into 7 parts with a summary, bibliography, and 2 appendices; the latter having to do with the Public Health Ordinance of British Guiana and mosquito control regulations. Part I, introduction and ecology; Part II, materials, equipment, insecticide dosage and techniques; Part III, malaria; Part IV, Bancroftian filariasis in

British Guiana; Part V, yellow fever control in British Guiana; Part VI, the effect of DDT on house frequenting arthropods and other vermin; Part VII, organization, progress, and cost of DDT campaign. Since basic conditions for mosquito production remain unchanged, Dr. Giglioli points out that DDT control must continue indefinitely to avoid reinfestation from the uncontrollable, uninhabited hinterland.—H. H. Stage, Bureau of Entomology and Plant Quarantine, U. S. Dept. Agric., Washington, D. C.

THE DESIGN AND CONSTRUCTION OF A REGULATED PRESSURE SPRAYER FOR MALARIA CONTROL OPERATIONS. By Louva G. Lenert and W. A. Legwen. Asoc. Interam. de Ingenieria Sanitaria. Ano 1, No. 4, Abril (April) 1948. Objections of varying air pressures and consequent varying discharge rates such as encountered in commercial hand type sprayers were overcome by the construction of a sprayer of new design.

The new sprayer, containing xylol-resistant materials and designated as the "Regulated Pressure" (RP) sprayer, was composed of two thin shell, high-strength steel tanks of equal size and capacity (approximately 2.16 gals.). One tank was used for air storage; the other for emulsion. An air valve was incorporated in the air tank which, in turn, was connected through a stopcock and pressure regulator to the emulsion tank. The filler opening of the emulsion tank was equipped with a commercial pipe-cap fitting onto which had been welded a handle for tightening purposes. The emulsion tank was equipped with a 0.25 in. bottom discharge outlet. A 0.25 in. copper tube protruded approximately 0.75 in. into the emulsion tank from this outlet and thus small quantities of trash and other sediment were retained in the tank. To the outlet were attached the desired length of hose, pipe wand and nozzle. The whole, weighing 19 lbs., was mounted on a single frame and carried knapsack fashion.

In operating the RP sprayer the pressure regulator was set to maintain an air pressure of 40 psi. in the emulsion tank. The stopcock between the two tanks was closed before filling the emulsion tank. After filling, the air tank pressure was restored to at least 85 psi. Air was introduced into the air reservoir by means of a hose from a compressor tank. An initial pressure of 85 psi. in the air reservoir permitted the discharge of the entire contents of the emulsion tank at a uniform pressure of 40 psi. With an initial pressure of 125 psi., two tankfuls of emulsion may be discharged at the prescribed pressure.

In comparison with single compartment sprayers, the demonstrated advantages of the R.P. sprayer are: (a) It permits the discharge of spray solution or emulsion at a uniform pressure and discharge rate. (b) The uniform discharge rate expedites crew training and improves the uniformity and consistency of surface application rates. (c) It requires less judgment and manual labor to operate. (d) Maintenance requirements are less and it may be constructed by an individual agency. (e) It considerably improves the efficiency of manual spraying operations.

As noted by the editor, while the DDT formulation used in this work was a xylol-aqueous emulsion, the equipment should prove quite satisfactory in areas using kerosene solutions or colloidal emulsion-suspensions of DDT. To a lesser extent it may be found suitable for use with spray formulations composed of aqueous suspensions of water-wettable DDT, since these are apt to require continuous agitation and a more complete accessibility of mechanical parts for cleaning.—Bryant E. Rees, Fresno State College, Fresno, Calif., Technical Advisor, Fresno MAD.

RIFT VALLEY FEVER. ISOLATION OF THE VIRUS FROM WILD MOSQUITOES. By K. C. Smithburn, A. J. Haddow, and J. D. Gillett. British J. Exp. Path., 29:107–121, 1948. Since 1937 the Medical Department of the Uganda Protectorate and the International Health Division of the Rockefeller Foundation have jointly supported intensified epidemiological investigations of yellow fever in Bwamba County in the Western Province of Uganda. Bwamba County is small (140 sq. mi.), and about 80 sq. mi. of it is covered with uninhabited dense primeval rain forest, the remainder being fairly intensively cultivated and supporting a population of over 30,000 persons. Incidental to the main problem (yellow fever) 4 hitherto unknown viruses (West Nile, Semliki Forest, Bwamba, and Bunyamwera viruses) have been isolated from wild mosquitoes. The present paper, in addition, records the isolation and identification of 6 strains of Rift Valley fever virus from *Aedes* and *Eretmapodites* spp.

Rift Valley fever is caused by an hepatotropic virus which thus far is known to affect sheep, cattle and man. In inhabited regions, sheep and cattle are believed to be the reservoirs of the disease; but in Bwamba, wild infected mosquitoes were taken in the uninhabited Semliki forest, and a serological survey of humans in nearby inhabited areas, of 72 wild monkeys, a red forest buffalo and a waterbuck yielded only one serum (human) with protective antibodies. Apparently some other wild host must be involved in the epidemiology of the disease in this area.

Rift Valley fever was known as a disease entity of sheep for some time when Daubney, Hudson, and Garnham discovered the virus and demonstrated its infectivity for man in 1931. They suggested mosquito transmission and later showed that the virus could be recovered from mosquitoes several days after an infective feeding. The present paper records the first time that the virus has ever been isolated from wild mosquitoes and a report of successful experimental transmission of the disease by mosquitoes is in press. Mosquito catches were made from January to July 8, 1944 but infected specimens were found only between April 18 and May 27. Since no

apparent epidemic was observed during the study the rôle that mosquitoes play in the epidemiology of the disease still has to be demonstrated.

Study of the epidemiology of the mosquito-borne virus diseases found in Bwamba is complicated by the fact that the mosquito fauna is very varied and includes many rare and little-known species. The adult females of several species are either inseparable or the separating characters so minute as to be almost impossible to see on the living specimen. All the catches were made by hand which, of course, would yield mainly females, and the specimens were identified alive in individual vials without the aid of an anaesthetic. Those who have ever tried to examine a living mosquito through the glass wall of a vial under a microscope will appreciate the difficulties. For these reasons the mosquitoes are referred to "groups" and not to species on the sound assumption, stated in an earlier paper, that it is better to refer a specimen to the correct group than to the wrong species. Virus was isolated from *Eretmapodites* spp., from a complex of *Aedes (Aedimorphus) tarsalis* Newst. and from a species which the authors have tentatively identified as *Aedes (Stegomyia) de-boeri* ssp. *de-meilloni* Edw. However, it is believed that the important vector or vectors are in the Eretmapodites group.

This paper is the latest to appear in a series of studies from a research institute which has as its primary objective the elucidation of the epidemiology of yellow fever. The studies and observations made in Bwamba are undoubtedly leading to that goal and at the same time providing the foundation for further fundamental studies on the interrelationships of viruses.—J. McClintock, Dominion Livestock Insect Laboratory, Lethbridge, Alberta, Canada.

CHRISTIAN COUNTY MOSQUITOES

EUGENE FIELD, 1850–1895

Dr. Cyrus Thomas, formerly of Carbondale, but now connected with the national entomological department at Washington, is temporarily in Illinois, investigating the habits of the mosquitoes that infest that magnificent Christian-county waterway, Flat Branch. By a judicious system of bear-traps exposed along the banks of Flat Branch, Dr. Thomas has possessed himself of a number of handsome specimens of Christian-county mosquitoes, and he is enabled therefore to pursue his researches with uncommon accuracy and ease. His investigations have not progressed to the extent, however, that he is able to declare positively that the Christian-county mosquito is an insect, and not a bird: in fact, there are numerous reasons for believing that these curious and ravenous creatures are a species of reptile, provided, by an inscrutable dispensation of nature, with wings. But his researches have developed many interesting and hitherto unknown facts about these remarkable and remorseless nondescripts. In the first place, the Flat Branch mosquitoes are carnivorous mammals: they nurse their young, and they are provided with incisor and molar teeth for the tearing and masticating of flesh. There is something almost human in the way they wear their beards and moustaches, yet they resemble the equine species in the particular of the spiked shoes with which they are invariably shod when they arrive at maturity, viz., the twenty-first year. In the matter of rearing their young, their habits seem to be like those of the ordinary prairie-chicken, for they retire in the early spring to quiet burrows or corn-fields along Flat Branch, and raise their broods, which have been known to number six hundred souls to one family; in July they become gregarious, and congregate in the timber, roosting in the high trees, and laying waste the human population of the surrounding country. Christian-county huntsmen —notably the Taylorville Sportsman's Association —employ different methods of capturing these destructive creatures. One way is by means of quail-nets; another is the old way of hunting them with pointer-dogs and gun; in the latter case, buckshot is used, and the heaviest kind of fowling piece is preferred. But the most popular method of capture is the pitfall—the same employed to entrap elephants in India. A deep pit is dug, a light covering is thrown over the opening, and on this covering is placed a hindquarter of beef. Attracted thither by the fumes of the meat, the mosquito unsuspectingly steps upon the deceitful pitfall, the slight fabric yields under the leviathan's weight, and with a sickening groan the winged monster is precipitated into his gloomy prison, from which he is not hoisted by his captors till he is enfeebled by captivity and starvation. In this way thousands of mosquitoes are taken annually by the people of Christian county, who derive a handsome profit from the pelts of the mosquitoes, which are tanned into shoe-leather, and the tusks, which are utilized for those varied purposes to which ivory is usually put. Considering the importance of this industry, it is not strange that the results of Dr. Thomas's explorations and researches are awaited with a solicitude bordering upon suspense.—Found and Contributed by Austin W. Morrill, Jr.