THE CDC ENTOMOLOGICAL CHILL TABLE, A REFRIGERATED UNIT FOR USE IN PROCESSING MOSQUITOES FOR VIRUS ISOLATION STUDIES

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When mosquitoes are collected in remote areas for virus isolation studies, it is usually more convenient to kill them and ship them to the processing laboratory on dry ice than to attempt to bring them in alive. At the laboratory, they must then be thawed to prevent breakage and identified prior to pooling and grinding for animal or tissue culture inoculation. During the laboratory operation the specimens must be kept cold at all times since current knowledge indicates that most, if not all, arboviruses are unstable in dead mosquitoes at room temperature.

Several methods have been used to effect this cooling, including working on cracked water-ice in plastic bags, on the side surface of frozen refreezant cans, or on inch-thick slabs of dry ice insulated with enough layers of paper toweling to prevent refreezing of the mosquitoes. These methods, while useful, were awkward, time consuming, and variable in respect to temperature of the working surface. To alleviate these difficulties a refrigerated unit was devised at the Arbovirus Vector Laboratory, Communicable Disease Center, and has been designated the CDC Entomological Chill Table.

The chill table consists of a 17″ x 20½″ surface plate cooled by coils beneath it, connected to a household type refrigeration unit mounted in the rear (Fig. 1). The temperature of the cooling surface is regulated by a thermostat. Three of these chill tables have been in use at the Arbovirus Vector Laboratory for over a year and have proved to be reliable and convenient to use.

DETAILS OF CONSTRUCTION. The unit, shown in Figures 1, 2, and 3, is rectangular in shape, 21″ x 31″ in dimension, and is designed to be placed upon a solid counter top with the refrigeration mechanism to the rear and the leading edge of the cold working surface even with the counter front. All numbers in parentheses refer to those in Figure 2.

The base frame for the unit (2) is made by heliarc welding a ⅛″ x 1″ x 31″ length of aluminum angle to each end of a 21″ length of the same type of angle. This forms a square-ended U, with the closed end being at the back of the unit. A second 21″ length of angle is welded into place 14″ from the first and parallel to it to form a 14″ x 21″ frame for the compressor unit. Two flat aluminum support strips, ¼″ x 2″ x 13¾″, are attached between the two 21″ crosspieces by screws. These strips bear the weight of the compressor unit. The compressor unit, Tecumseh No. 43 LTK,[2] is mounted on 1″-thick sponge rubber pads to reduce vibration and is loosely fastened to the support strips with ¼″ bolts.

The thermostat, Ranco No. 010–1469 (−10° to −40° F.) (6) is mounted on an aluminum plate, ¼″ x 6″ x 3″, which is fastened to the frame as shown in Figure 2. The bulb portion of the thermostat is attached beneath the cooling surface (3) near the center.

A 2″ section of 1″ angle is bolted to a small plate, ¼″ x 3″ x 3″, and the plate is fastened to the frame to serve as a support for the electrical outlet box. A combination switch, pilot light, and female re-

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[2] Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or by the U. S. Department of Health, Education, and Welfare.

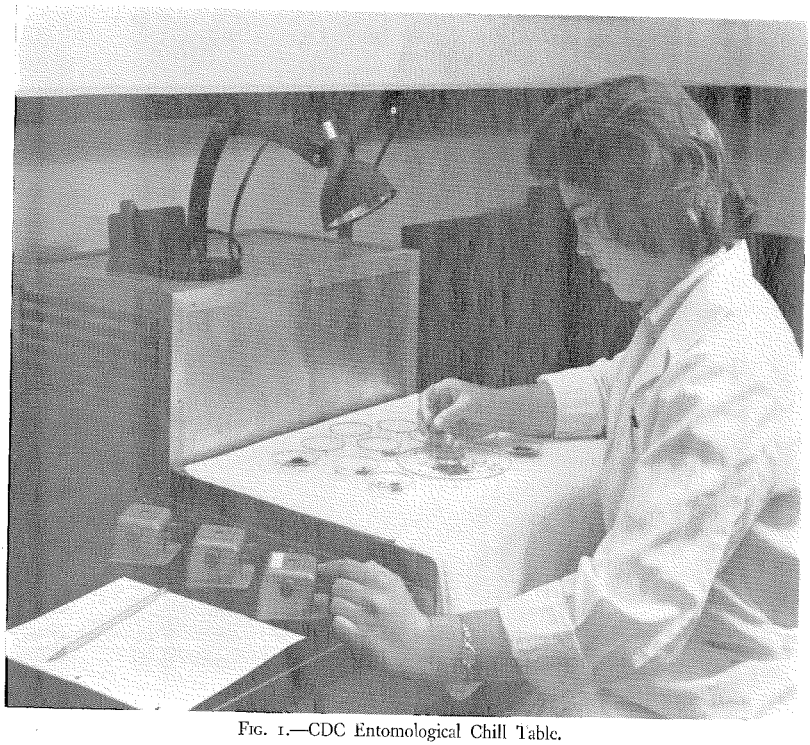

FIG. 1.—CDC Entomological Chill Table.

ceptacle (7) is installed in the box. Care should be taken when making the electrical connections to ground the frame.

A coolant tubing pan (8) is constructed of 22 gauge aluminum, 2″ deep x 17″ x 20½″. Angle aluminum 1″ x 1″ is riveted ⅜″ below the top of the pan and covered with a ⅛″ layer of cork. Four wooden blocks, 1¾″ square, are positioned at each corner and fastened to the bottom of the pan. The angles and blocks serve as a base for the cooling surface plate (3). Plexiglas strips, ¼″ x ½″, are fastened over the cork strips to completely insulate the cooling surface plate (3) from the pan (8). The bottom of the pan is insulated with a 3″ thickness of fiber glass insulation, see section "A-A," of Figure 2, also Figure 3. Approximately 22 feet of ⅜″ copper tubing is carefully shaped into the configuration shown in Figures 2 and 3 to form the coolant tube (5). The shaped coils are arranged on the bottom of the ¼″ x 16″ x 20¼″ aluminum plate cooling surface (3) and 3 pieces of aluminum, ¼″ x 1½″ x 16″, are placed over the tube and secured firmly with screws to the cooling surface. Care should be taken to insure close contact between the coolant tube (5) and the cooling surface (3) since the cooling of the working surface is by direct conduction.

A 12″ length of ¼″ copper tubing is connected to the receiver. A 24″ length of capillary tubing, 0.036″ ID, 0.087″ OD, is soldered to the end of the ¼″ tubing. The capillary tube is then run 6″ under the cooling surface plate where a gas-tight connection is made to one end of the ⅜″ coil. The other end of the ⅜″ coil is connected to the compressor.

Approximately 5 to 6 ozs. of Freon 12 gas is used to charge the refrigeration system on a critical-charge basis. Frosting of

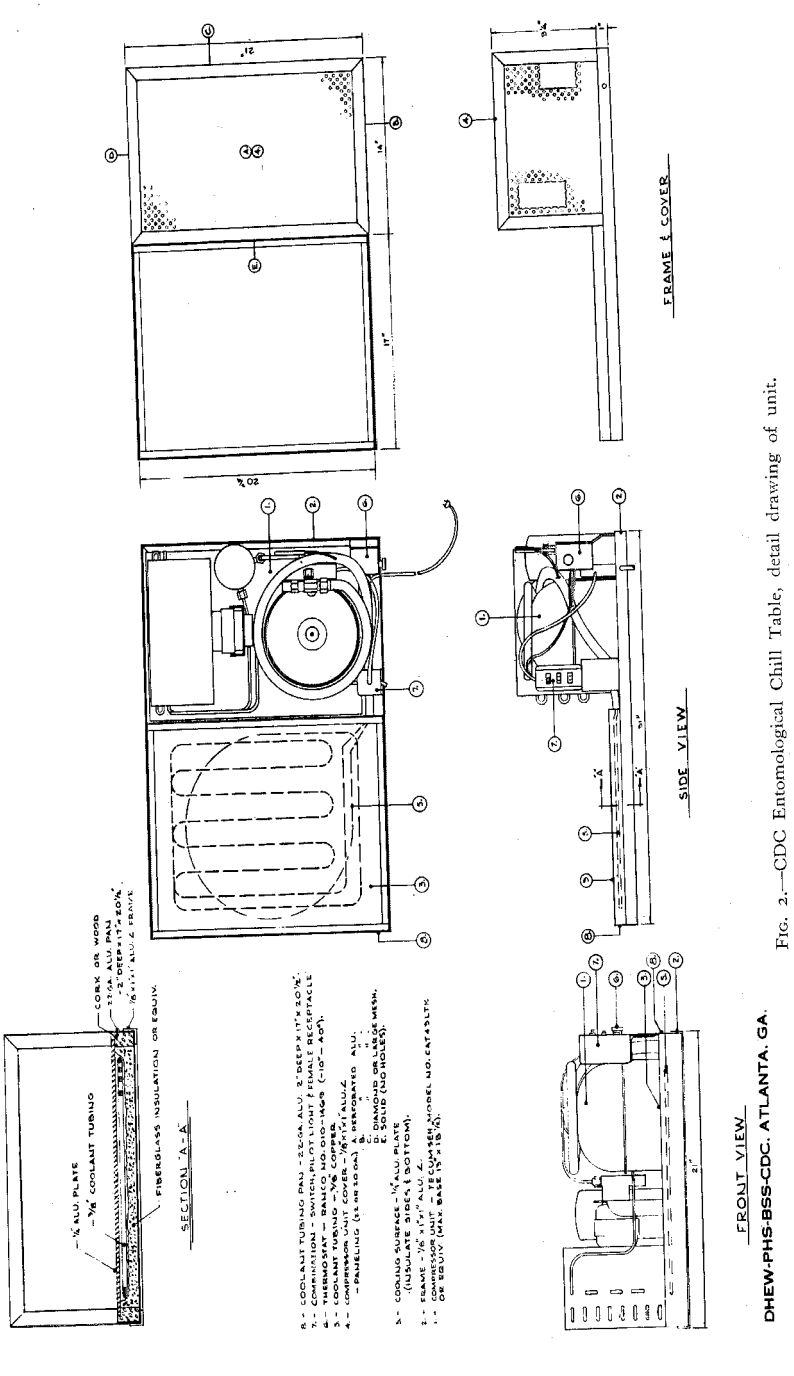

FIG. 2.—CDC Entomological Chill Table, detail drawing of unit.

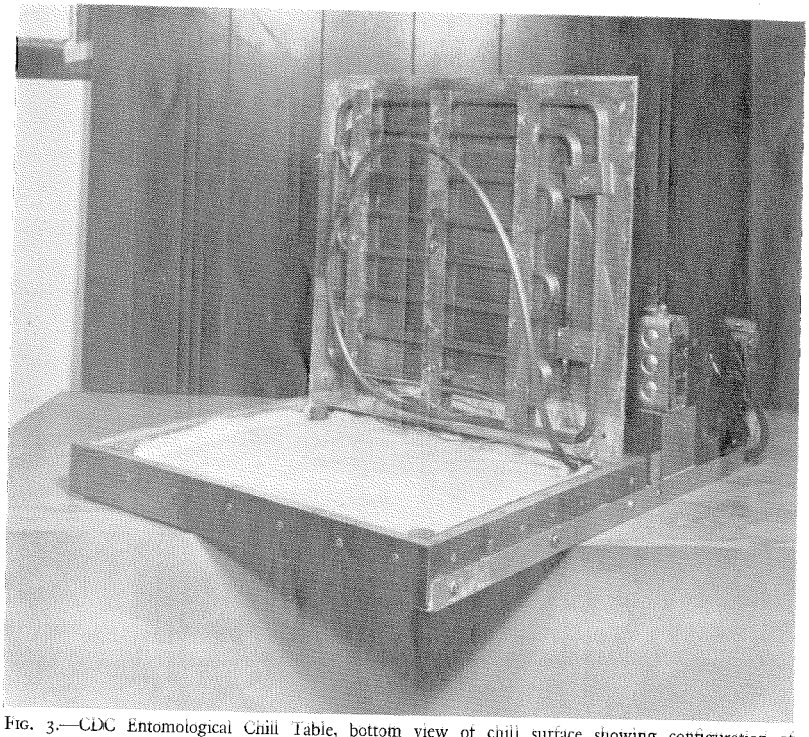

FIG. 3.—CDC Entomological Chill Table, bottom view of chill surface showing configuration of cooling coil.

the coolant tube (5) should not occur outside of the coolant pan (8). After charging is completed, the portion of the coolant tubing beyond the pan should be insulated up to its entry into the compressor.

A cover for the compressor unit (4) is constructed from 1″ x 1″ angle aluminum frame with the dimensions shown in Figure 2. Surfaces A, B and C, Figure 2, are made of perforated aluminum sheets which are riveted to the frame. Appropriate cut-outs for the switch and thermostat are made. The cooling air is taken in through side D, and requires a larger mesh or diamond pattern aluminum screen. Side E is solid sheet aluminum to prevent air currents from blowing over the mosquitoes being examined.

A single thickness of bath towel is placed on the chill plate to provide a convenient working surface. The thermostat should be adjusted to a position permitting a layer of frost to accumulate on the surface of the towel. The chill table may be operated satisfactorily without a thermostat; however, the continuous operation of the unit will result in greater frost formation. Temperatures taken below the towel should be approximately −18° C., and the temperature on top of the towel around −2° C., for maximum efficiency of the unit. Mosquitoes are best sorted in petri dish halves lined with dampened and well-blotted filter paper. The slightly dampened filter paper allows good heat conduction while also absorbing moisture condensing from the air.

A microscope lamp can be plugged into the receptacle provided on the combination switch. A sponge-rubber arm rest can be used on the edge of the chill plate for greater comfort of the technican when sorting the mosquitoes.

SUMMARY. A refrigerated unit, desig-

nated as the CDC Entomological Chill Table and useful for processing mosquitoes for virus isolation studies, is described and details of construction are given. The chill table consists of a surface plate which is cooled by a coil beneath it. A household type refrigeration unit is used to provide cooling. The temperature of the cooling surface is regulated by a thermostat. Three of these chill tables have been in use at the Arbovirus Vector Laboratory for over a year and have proved to be reliable and convenient to use.

TRANSMISSION OF THE R O STRAIN OF *PLASMODIUM CYNOMOLGI* BY *A. STEPHENSI, A. QUADRIMACULATUS* AND *A. LABRANCHIAE ATROPARVUS*

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Plasmodium cynomolgi is a tertian malaria parasite which was first described by Mayer (1907) from a *Macaca irus* monkey brought to Germany from Java. It was redescribed by Sinton and Mulligan (1932–1933) from parasites found in a *Macaca irus* said to be from Singapore.

The transmission of strains and subspecies of *P. cynomolgi* has been studied by a number of investigators. Transmission of the parasite by mosquito bite has been demonstrated using *Anopheles freeborni* (Eyles 1960a), *A. quadrimaculatus* (Hawkins *et al.*, 1948), *A. labranchiae atroparvus* (Shortt and Garnham, 1948), *A. aztecus* (Garnham, 1959), and *A. stephensi* (Ramakrishnan and Mohan, 1962). In addition, transmission has been obtained by the intravenous inoculation of infected salivary glands from *A. albimanus* (Eyles, 1960b) from *A. kochi, A. lesteri, A. letifer, A. maculatus, A. philippinensis* and *A. sundaicus* (Warren *et al.*, 1963).

The present studies were made to investigate the RO strain of *P. cynomolgi* in regard to its infectivity to and transmission by the five species of *Anopheles* being used in this laboratory. Previous reports of transmission of this strain have been limited to *A. freeborni* (Schmidt, 1964).

MATERIALS AND METHODS. The RO strain of *P. cynomolgi* was isolated in December 1960 from a *Macaca mulatta* monkey imported from the Burma-Assam area. After isolation it was maintained by serial monkey-mosquito *(A. freeborni)* transfers (Schmidt, 1964) until February 1964, when the strain was established in this laboratory in an *M. mulatta* monkey (No. C-159) by the intravenous inoculation of 64 pairs of infected salivary glands. Subsequently this strain has been maintained in *M. mulatta* monkeys either by the intravenous inoculation of sporozoites or of parasitized blood.

The Q-1 strain of *A. quadrimaculatus,* originally from Southeastern United States, has been maintained in the laboratory since 1941. The F-1 strain of *A. freeborni* from Marysville, California, has been maintained as a laboratory colony since 1944. The *A. stephensi,* originally from India, and the *A. labranchiae atro-*

[1] With the technical assistance of Harvey Akins and Peggy Sue Stanfill.