



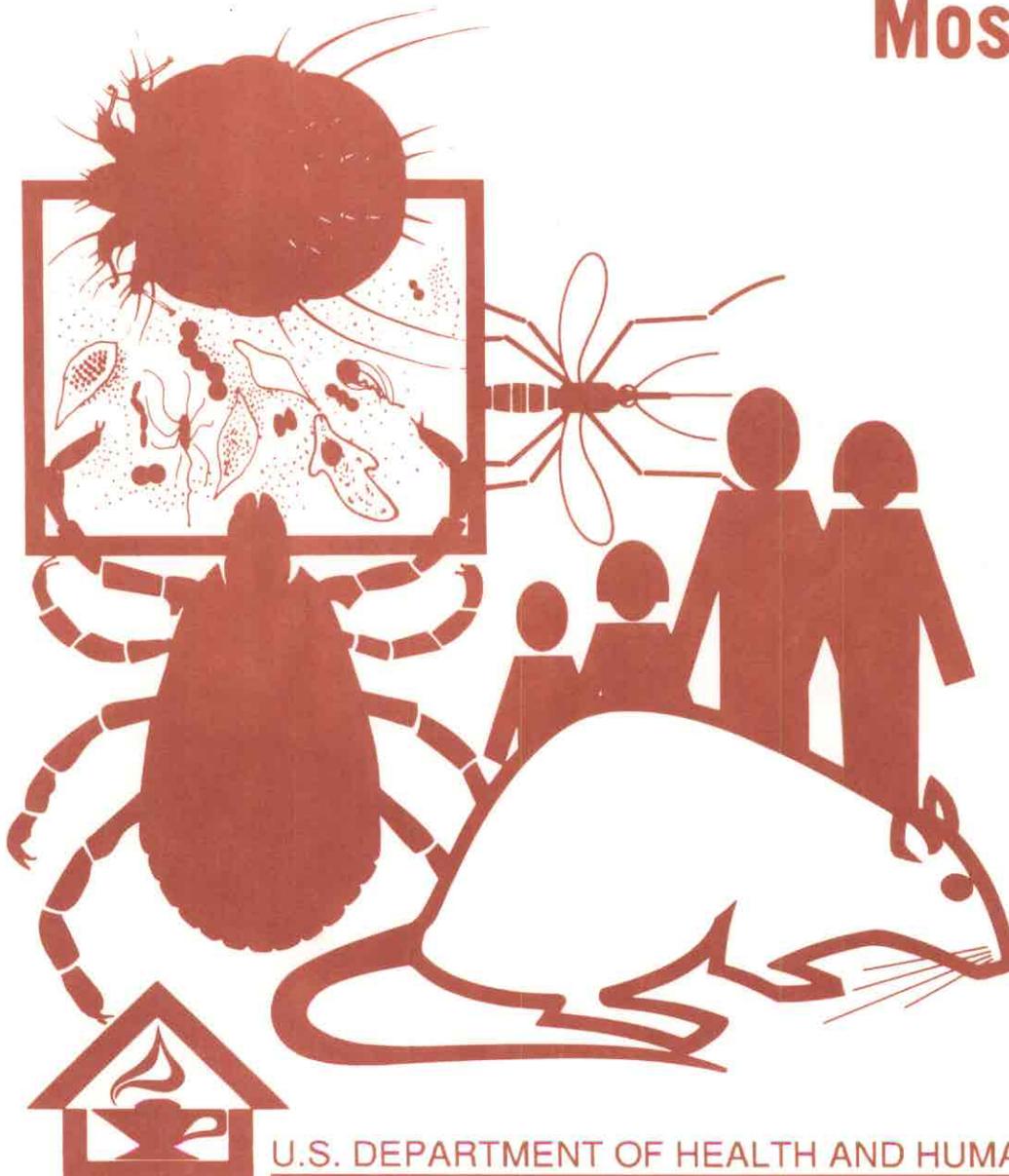
LESSON

6

SELF-STUDY COURSE 3013-G

Vector-Borne Disease Control

Mosquitoes



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SELF-STUDY

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

PUBLIC HEALTH SERVICE
Centers for Disease Control
Public Health Practice Program Office
Atlanta, Georgia 30333

VECTOR-BORNE DISEASE CONTROL

Self-Study Course 3013-G

LESSON 6: MOSQUITOES

I: LESSON CONSISTS OF:

- Part I: 25 multiple choice questions
- Part II: 25 true-false questions
- Part III: 25 multiple choice questions
- Part IV: 25 true-false questions

II: REFERENCE:

Mosquitoes of public health importance and their control.

III: TOPICS AND READING ASSIGNMENTS:

	<u>Mosquitoes</u>
A. Introduction	1
B. Mosquitoes as Disease Vectors	1- 7
C. General Characteristics and Life Cycle	8-14
D. Notes on Important Species of Mosquitoes	14-28
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F. The Control of Mosquitoes	37-48
G. Public Relations	48

VECTOR-BORNE DISEASE CONTROL

Lesson 6 - Objectives

Upon successful completion of Lesson 6, the student should be able to correctly:

- Identify and recognize the public health importance, biological aspects, and methods of control of mosquitoes.
- Identify the methods of transmission of disease by mosquitoes, the diseases transmitted by each method, and, for selected diseases, the types of mosquitoes which commonly transmit them.

VECTOR-BORNE DISEASE CONTROL

LESSON 6: MOSQUITOES

Part I: Multiple Choice

1. Which one of the following mosquitoborne diseases continues to occur with some frequency in the United States?
 - A. Malaria
 - B. Filariasis
 - C. Dengue
 - D. Encephalitis

2. The cycles of Eastern equine, Western equine, and St. Louis encephalitis viruses are similar in that they are normally transmitted by mosquitoes from:
 - A. Birds to small mammals to humans.
 - B. Birds to other birds to humans.
 - C. Small animals to birds to humans.
 - D. Horses to humans.

3. A common vector of St. Louis encephalitis in urban areas is:
 - A. *Anopheles quadrimaculatus*.
 - B. *Aedes aegypti*.
 - C. *Culex restuans*.
 - D. *Culex pipiens*.

4. *Culex tarsalis* is a very important vector in the United States because it has the ability to transmit the viruses causing:
 - A. St. Louis and California encephalitis.
 - B. California and Western encephalitis.
 - C. Eastern and St. Louis encephalitis.
 - D. St. Louis and Western encephalitis.

5. Which of the following vectors is responsible for transmission of both dengue and yellow fever?
 - A. *Anopheles quadrimaculatus*.
 - B. *Aedes aegypti*.
 - C. *Aedes sollicitans*.
 - D. *Culex pipiens*.

6. Which of the following diseases listed below is NOT caused by a virus?
- Eastern encephalitis.
 - Yellow fever.
 - Malaria.
 - Dengue.
7. The vector of malaria in the eastern United States is:
- Anopheles quadrimaculatus*.
 - Aedes aegypti*.
 - Culex pipiens*.
 - Aedes vexans*.
8. California encephalitis differs from the other mosquito-borne encephalitides because the virus is transmitted by mosquitoes from:
- Birds to small mammals to humans.
 - Birds to other birds to humans.
 - Small mammals to humans.
 - Horses to humans.
9. Although mosquitoes and flies belong to the same order (*Diptera*), mosquitoes are different because they:
- Can suck blood.
 - Need to lay eggs in water.
 - Have long, segmented antennae, an elongate proboscis, and wing scales.
 - Have elongate leg and antennae structures.
10. In general, anopheline larvae may be distinguished from culicine larvae by the fact that:
- Anopheline larvae have an air tube and palmate hairs.
 - Anopheline larvae have an air tube and no palmate hairs.
 - Culicine larvae have an air tube and no palmate hairs.
 - Culicine larvae have no air tube and no palmate hairs.
11. Male mosquitoes can be distinguished from females by the fact that:
- Male mosquitoes suck blood and females do not.
 - Male mosquitoes have bushy hairs on their antennae and females have short, sparse hairs on theirs.
 - Female mosquitoes have bushy hairs on their antennae and males have short, sparse hairs on theirs.
 - Female mosquitoes rest with their abdomens straight in the air.

12. The flight range of the female yellow fever mosquito is considered to be:
- A. One block.
 - B. One-half mile.
 - C. One mile.
 - D. Two miles.
13. The maximum flight range of the female malaria mosquito is about:
- A. One block.
 - B. One-half mile.
 - C. One mile.
 - D. Five miles.
14. The effective flight range of the female salt-marsh mosquito is usually considered to be:
- A. One-half mile.
 - B. One mile.
 - C. 2-4 miles.
 - D. 5-20 miles.
15. Concerning the female mosquito's cycle of feeding, egg-laying, and feeding, which of the following is CORRECT?
- A. Blood meals from the same host are required for eggs to develop.
 - B. The process of digesting a blood meal, laying a batch of eggs, and seeking another blood meal requires two or more days.
 - C. If a malaria parasite is ingested, the mosquito is immediately infective.
 - D. Several blood meals are required before egg-laying can proceed.
16. A female mosquito with short palpi, a lyre-shaped, silvery-white marking on the thorax, and white-banded legs, belongs to the species:
- A. *Anopheles quadrimaculatus*.
 - B. *Aedes aegypti*.
 - C. *Culex pipiens*.
 - D. *Psorophora columbiae*.
17. A mosquito with several generations a year, which lays its eggs singly on the sides of artificial containers, at or above water level is:
- A. *Culex pipiens*.
 - B. *Aedes vexans*.
 - C. *Culex tarsalis*.
 - D. *Aedes aegypti*.

18. A mosquito with several generations a year, which lays its eggs on the ground and whose larvae develop in temporary pools is:
- A. *Aedes aegypti*.
 - B. *Aedes triseriatus*.
 - C. *Aedes vexans*.
 - D. *Anopheles quadrimaculatus*.
19. A female mosquito with long palpi, four dark spots near the center of each wing, and dark legs, is a member of the species:
- A. *Anopheles quadrimaculatus*.
 - B. *Culex pipiens*.
 - C. *Aedes aegypti*.
 - D. *Psorophora columbiae*.
20. It is typical for *Anopheles quadrimaculatus* larvae to occur abundantly in:
- A. Tin cans.
 - B. Tree holes.
 - C. Temporary pools.
 - D. Quiet water with some vegetation.
21. A mosquito with many generations a year, which lays egg rafts on the water surface and prefers water with some organic materials is:
- A. *Anopheles quadrimaculatus*.
 - B. *Culex pipiens*.
 - C. *Aedes vexans*.
 - D. *Aedes aegypti*.
22. Mosquitoes of which species listed below rest in and around buildings during the day and are active only after dark?
- A. *Aedes aegypti*.
 - B. *Culex pipiens*.
 - C. *Aedes vexans*.
 - D. *Aedes sollicitans*.
23. *Coquillettidia perturbans* larvae are usually found:
- A. In tin cans.
 - B. In tree holes.
 - C. Attached to roots of aquatic plants.
 - D. In temporary pools.

24. Which common name of a mosquito listed below IS NOT ASSOCIATED with the scientific name following it?
- A. Common malaria mosquito (*Anopheles quadrimaculatus*)
 - B. Yellow fever mosquito (*Aedes aegypti*)
 - C. Ricefield mosquito (*Psorophora ferox*)
 - D. Southern house mosquito (*Culex pipiens*)
25. The ricefield mosquito lays its eggs:
- A. On the surface of water.
 - B. In ditches that contain dirty water.
 - C. On damp ground that is subject to flooding.
 - D. On decaying rice straw.

Part II: True-False - Mark "A" for True, "D" for False.

1. World-wide, a high proportion of the arthropodborne viruses known to affect humans are transmitted to humans by mosquitoes.
2. California encephalitis does not occur routinely, except in the Central Valley of California.
3. Species of *Anopheles* are the only mosquitoes which transmit human malaria.
4. The last major yellow fever epidemic in the United States was in New Orleans in 1905.
5. Culicine mosquitoes include the genera *Culex*, *Aedes*, and *Psorophora*.
6. Male mosquitoes bite human beings readily after dark.
7. Most *Culex* and *Anopheles* mosquitoes overwinter as adult females.
8. The floodwater species of the genera *Aedes* and *Psorophora* mosquitoes generally deposit their eggs on damp earth.
9. *Anopheles* mosquitoes lay their eggs singly on the water surface.
10. *Culex* mosquitoes deposit their eggs in rafts on the water surface.
11. *Psorophora* mosquitoes have only one generation a year.
12. By preference, *Aedes vexans* mosquitoes breed in permanent ponds.
13. *Aedes triseriatus* larvae are often found in salt marshes.
14. A typical breeding place of *Aedes aegypti* is in water that accumulates in discarded auto tires.
15. Adult yellow fever mosquitoes (*Aedes aegypti*) bite fiercely at night.
16. The *Aedes* species *cantator*, *sollicitans*, and *taeniorhynchus* all have similar breeding habits.
17. Adult *Culex* and *Anopheles* mosquitoes often rest in houses or in dark, damp shelters in the daytime, and bite at night.
18. *Anopheles quadrimaculatus* mosquitoes in buildings often bite during the day.
19. The northern and southern house mosquito (*Culex pipiens*) often bites humans in broad daylight.

20. *Culex tarsalis* adults are active chiefly from dawn to sundown.
21. *Culiseta inornata* mosquitoes often transmit Western equine encephalitis to humans.
22. Surface larvicides can be used effectively against *Mansonia* and *Coquilletidia* larvae.
23. The larvae of the gallinipper (*Psorophora ciliata*) are predacious, feeding on other mosquito larvae.
24. *Psorophora ferox* adults in wooded areas bite readily.
25. The operational mosquito survey includes information on life cycles, feeding preferences, larval habitats, and adult resting places.

Part III: Multiple Choice

1. Mosquito surveys are essential for the planning operation and evaluation of any effective mosquito control program. Which of the following is an INCORRECT statement about the possible value and/or use of such surveys?
 - A. Mosquito surveys determine actual populations.
 - B. Mosquito surveys furnish data for evaluating control effectiveness.
 - C. Surveys disclose which species are present.
 - D. Surveys should include both larval and adult populations.

2. In a mosquito control program, a schematic map is essential for:
 - A. Program evaluation.
 - B. Locating and recording larval breeding places.
 - C. Locating and recording adult sampling stations.
 - D. All of the above.

3. The number and relative abundance of the various mosquito species in a community can be estimated by:
 - A. Larval surveys.
 - B. Adult mosquito surveys.
 - C. Mosquito egg surveys.
 - D. Morbidity data of human and animal diseases.

4. Carbon dioxide is used as an attractant in which of the following traps?
 - A. American trap
 - B. New Jersey trap
 - C. Lard can trap
 - D. Stable trap

5. Adult *Culex quinquefasciatus* and *Anopheles quadrimaculatus* mosquitoes are usually collected in:
 - A. Daytime hand catches.
 - B. Nighttime hand catches.
 - C. Daytime resting places.
 - D. Window traps.

6. The mosquito light trap is used to:
 - A. Control mosquitoes.
 - B. Sterilize male mosquitoes.
 - C. Give an index as to the mosquito species attracted to light.
 - D. Collect all species of mosquitoes.

7. During the breeding season, inspections for mosquito larvae should be made at intervals of:
 - A. Once each year.
 - B. One to two weeks.
 - C. One to two months.
 - D. Three to six weeks.

8. Surveys using egg-separation machines have been used in the United States to locate breeding places of:
 - A. *Anopheles*.
 - B. *Culex* and *Psorophora*.
 - C. *Aedes* and *Psorophora*.
 - D. *Mansonia*.

9. Investigators have found that little or no transmission of Western equine or St. Louis encephalitis occurred in California when light trap collections of *Culex tarsalis* contained no more than:
 - A. 10 females per trap per night.
 - B. 20 females per trap per night.
 - C. 25 females per trap per night.
 - D. 30 females per trap per night.

10. The amended Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires persons who apply restricted-use pesticides to be certified, or to work under a certified person's supervision. The certification examination is usually given by:
 - A. A State agency.
 - B. The U.S. Department of Agriculture.
 - C. The U.S. Environmental Protection Agency.
 - D. A country or local agency.

11. Which of the following would be considered a naturalistic method for mosquito control?
 - A. Larviciding
 - B. Adulticiding
 - C. Water and land management
 - D. Insect growth regulators

12. The proper preimpoundment preparation of a reservoir to eliminate potential mosquito producing habitats consists of:
 - A. Shoreline conditioning.
 - B. Vegetation removal.
 - C. Providing for drainage.
 - D. All of the above.

13. Which of the following is NOT TRUE about irrigation systems as sources of mosquitoes?
- A. Irrigation distribution canals are major sources of mosquito production.
 - B. Irrigation systems are among the largest contributors to the mosquito problem in the western United States.
 - C. In the past, irrigated fields were frequently observed to be abundant mosquito producers.
 - D. The important sources of mosquitoes in the distribution system are seepages from unlined canals.
14. The most promising method of biological control of mosquito larvae is by use of:
- A. Mosquito fish (*Gambusia*).
 - B. Predaceous mosquito larvae.
 - C. Viruses.
 - D. Protozoa.
15. In the use of larvicides, the degree of control is determined by:
- A. Degree of pH.
 - B. Pollution of the water.
 - C. Type and amount of vegetation present.
 - D. All of the above.
16. Which of the following formulations is used for pre-hatch treatment of soil in dried up mosquito-breeding areas that are seeded with eggs of temporary pool mosquitoes?
- A. Pellets
 - B. Emulsions
 - C. Wettable powders
 - D. Oil solutions
17. In oil larviciding for mosquitoes, the addition of a spreading agent reduces the amount of oil required to about:
- A. 2-5 gallons per acre.
 - B. 10-12 gallons per acre.
 - C. 15-20 gallons per acre.
 - D. 1% of the amount originally required.
18. Among the more widely-used organic phosphorus insecticides in mosquito control are:
- A. Methoxychlor and lindane.
 - B. Pyrethrum and Abate.
 - C. Malathion and propoxur.
 - D. Temephos (Abate) and methyl and ethyl parathion.

19. Which organophosphate insecticide should not be used as a larvicide in urban areas?
- A. Malathion
 - B. Methyl and ethyl parathion
 - C. Dursban
 - D. Fenthion
20. In the control of adult mosquitoes by space spraying, which of the following best describes the results expected?
- A. Long term control
 - B. Temporary control
 - C. Destruction of larvae
 - D. Elimination of breeding areas
21. In the United States, airplane application of insecticides has been used to control outbreaks of:
- A. Encephalitis.
 - B. Malaria.
 - C. Yellow fever.
 - D. Giardiasis.
22. Two insecticides approved to kill adult mosquitoes by ULV application from airplanes are:
- A. Abate and chlorpyrifos.
 - B. Abate and parathion.
 - C. Malathion and Naled.
 - D. Malathion and carbaryl.
23. A residual fumigant used in insect control is a mixture of:
- A. Sulfur dioxide, hydrocyanic gas, and methyl bromide.
 - B. Odoriferous malathion applied by spray.
 - C. An insecticide that contains a masking agent.
 - D. Dichlorvos vapor released slowly from a resin strip.
24. Which of the following insecticides is used in domestic aerosol dispensers because of its quick knockdown capability coupled with low toxicity to persons?
- A. Piperonyl butoxide
 - B. Methoxychlor
 - C. Pyrethrum
 - D. Freon 12

25. The most important factor in the success of a modern mosquito control program is:
- A. The use of strong and efficient insecticides.
 - B. Aircraft for spraying operations.
 - C. The latest model fogging and misting machines.
 - D. A courteous, well-informed staff.

Part IV: True-False - Mark "A" for True, "D" for False.

1. The greatest value in the use of schematic and contour maps is for public relations - such as exhibits at local, county and state fairs.
2. Interpreting mosquito survey reports correctly results in the most efficient use of time by staff, materials, and equipment.
3. In areas where electric power is not available, animal bait traps can be used to collect live mosquitoes.
4. Collections from unscreened houses used as adult resting stations usually have more public health significance than collections from stables.
5. The American mosquito light trap is used to control mosquitoes.
6. Mosquito light traps attract adults from a considerable area and are not affected by competing light sources.
7. Light traps give a reliable index of adult populations of *Anopheles quadrimaculatus*.
8. Yellow fever mosquitoes are rarely collected in light traps.
9. Egg surveys are undertaken primarily to locate the breeding places of mosquitoes of the genera *Aedes* and *Psorophora*.
10. Mosquito control activities are the responsibility of the Federal government because flight patterns carry mosquitoes across state lines.
11. For ecological reasons, naturalistic control methods are generally considered to be more desirable than dependence on chemical control.
12. Flooding or diking marshlands changes the physical habitat and reduces the size of the *Aedes* population.
13. It is desirable to use the same insecticide as both larvicide and adult control.
14. Larvicides in pellet or granular form are used specifically for controlling larvae on clean shorelines or other breeding sites that are free of vegetation.
15. Petroleum oils are toxic to eggs, larvae, and pupae of both anopheline and culicine mosquitoes.
16. Most organophosphate larvicides combine with water and break down into compounds that do not contaminate the environment.

17. Abate should not be used as a mosquito larvicide in strengths less than 2 pounds per acre.
18. When using fenthion as a mosquito larvicide, at least 3 weeks should elapse between applications.
19. Control of adult mosquitoes by space spraying provides long-term control of adult mosquitoes.
20. Thermals and wind velocities of more than 6 miles per hour limit effective fogging operations for mosquito control.
21. The recommended vehicle speed for optimum operation of ULV ground equipment is about 20 miles per hour.
22. The ordinary 16 meshes-per-inch window screen can be penetrated by most mosquitoes.
23. Most pressurized aerosol insecticide dispensers contain pyrethrum or allethrin, which have a low human toxicity, and can be used in the home.
24. Public education about mosquito biology and control adds little to the effectiveness of a mosquito control program.
25. Bioassay tests are considered to be more valuable than sampling of natural larval habitats for larvae before and after an application is made.

DHHS:PHS:CDC:PHPPPO
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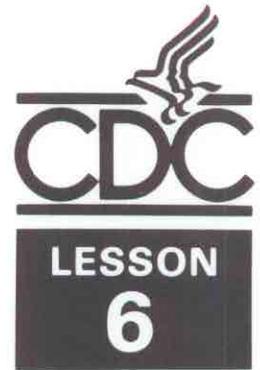
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SELF-STUDY COURSE 3013-G

Vector-Borne Disease Control

ANSWER SHEET

PART I				PART II			PART III				PART IV				
NO.	A	B	C	D	NO.	A	D	NO.	A	B	C	D	NO.	A	D
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