

## ASSIGNMENT 2

1. Consider a disease known as diabetes mellitus, which is characterized by an increase in the blood sugar level. Infectious agents may contribute to the development of the disease in early childhood, but are not the main cause of the disease. Can it be classified as communicable? Explain your reasons

### Definition:

According to WHO Diabetes mellitus “is a chronic disease caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. Such a deficiency results in increased concentrations of glucose in the blood, which in turn damage many of the body's systems, in particular the blood vessels and nerves”.

There are two principle forms of diabetes:

- **Type 1** diabetes (formerly known as insulin-dependent) in which the pancreas fails to produce the insulin which is essential for survival. This form develops most frequently in children and adolescents, but is being increasingly noted later in life.
- **Type 2** diabetes (formerly named non-insulin-dependent) which results from the body's inability to respond properly to the action of insulin produced by the pancreas. Type 2 diabetes is much more common and accounts for around 90% of all diabetes cases worldwide. It occurs most frequently in adults, but is being noted increasingly in adolescents as well (WHO, 2019).

### Brief History

Literature review suggested that diabetes mellitus has been identified and studied as a medical condition from as early as 1500 BC. Although a number of the studies defined what is currently known as the type 1 diabetes mellitus. Egyptologist Georg Ebers in 1874, describes a condition of “too great emptying of the urine” – perhaps, the reference to diabetes mellitus. For the treatment of this condition, ancient Egyptian physicians were advocating the use of wheat grains, fruit, and sweet beer. Ebers Papyrus, which was written around 1500 BC, excavated in 1862 AD from an ancient grave in Thebes, Egypt. Around 230 BC, Apollonius of Memphis for the first time used the term “diabetes,” which in Greek means “to pass through” (dia – through, betes – to go). He and his contemporaries considered diabetes a disease of the kidneys and recommended, among other ineffective treatments, such measures as bloodletting and dehydration and the first complete clinical description of diabetes appears to have been made by Aulus Cornelius Celsus (30 BC–50 AD)

### Symptoms:

The symptoms of diabetes varies and it may be pronounced, subdued, or even absent.

- In Type 1 diabetes, the classic symptoms are excessive secretion of urine (polyuria), thirst (polydipsia), weight loss and tiredness.
- These symptoms may be less marked in Type 2 diabetes. In this form, it can also happen that no early symptoms appear and the disease is only diagnosed several years after its onset, when complications are already present. (Lakhtakia,2013).

## Causes of Diabetes

The exact cause of type 1 diabetes is unknown. But it occurs when the body's own immune system, which normally fights harmful bacteria and viruses, mistakenly destroys the insulin-producing (islet, or islets of Langerhans) cells in the pancreas. Other possible causes include: Genetics also plays a role in type 1 diabetes, pancreatic diseases can also be the cause of type 1 diabetes and Exposure to viruses and other environmental factors.

Type 2 diabetes can occur when the body becomes resistant to insulin. Cells are not able to absorb glucose as a result of this resistance. Excess abdominal fat is a major cause, in addition to genetics and lifestyle. (<https://www.mayoclinic.org/diseases-conditions/type-1-diabetes/symptoms-causes/syc-20353011>)

## Review of Chain of Infection of Communicable Disease against diabetes mellitus

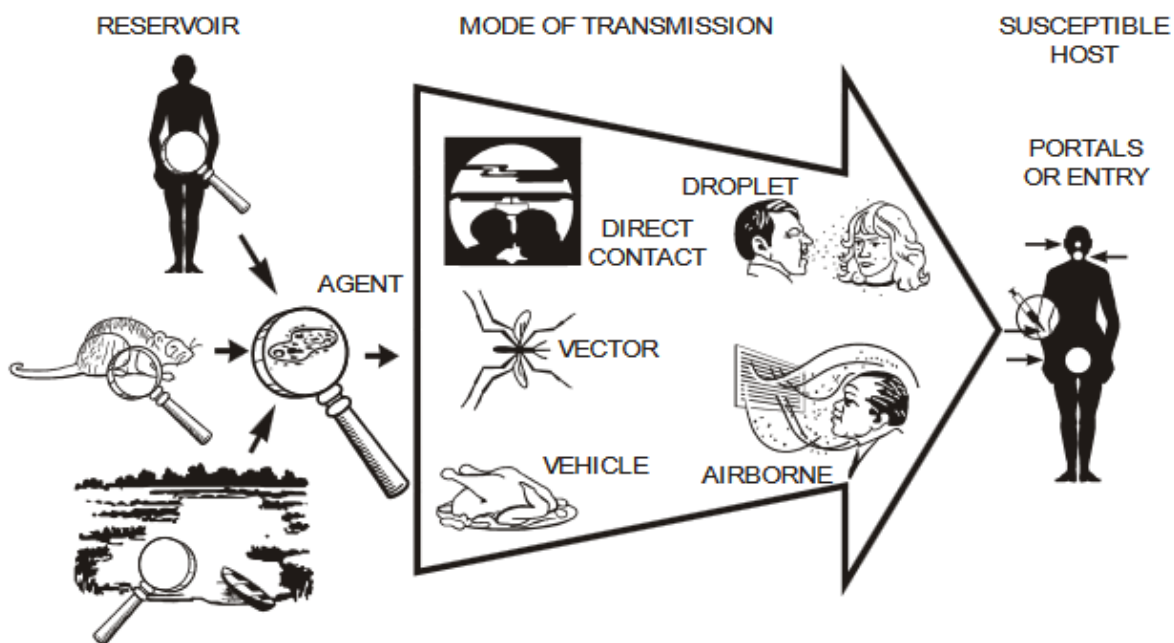


Figure 1: Chain of Infection.

(<http://www.ciphi.ca/hamilton/Content/documents/principles.pdf>)

- Disease Organism (Agent)

Though virus has been identified as a contributory factor to the causes of diabetes but it has not been specifically identified to be the major cause. This is unlike most of the communicable diseases that are caused by bacteria and fungi.

- Reservoir

Considering diabetes mellitus there is no reservoir where the infecting agent resides before infecting the new human. The root cause is more of a malfunction of a body part. This is unlike communicable diseases where the infectious agent resides somewhere else before infecting the new host.

- Mode of Escape and Entry

From the review of some epidemiology of diabetes mellitus, it can be opined that diabetes is not transmitted through any of the know modes of escape or entry of communicable diseases such Respiratory tract, gastrointestinal tract, skin or blood. In other words it cannot leave a patient to infect a susceptible humane.

- Mode of Transfer

Diabetes mellitus is not transmitted from an active patient to a susceptible human after they have been given birth to. It is not transmitted through the direct (person to person or trans placental transmission) or indirect modes of transmission (i.e. airborne, waterborne vehicle-borne)

- Susceptible Host

Infectious agent from a person suffering from diabetes mellitus is not responsible for infecting a third party. A person is susceptible by virtue of their gene, environmental exposures and lifestyle

Considering the above background especially the review of the chain of infection, diabetes mellitus cannot be classified as communicable disease. This position is also in line with the assertion of the global diabetes community. (<https://www.diabetes.co.uk/diabetes-causes.html>)

2. How would you classify pulmonary tuberculosis using the epidemiologic method? What is the main importance of such classification?

### **What is pulmonary tuberculosis?**

According to healthline, Pulmonary TB occurs when Mycobacterium tuberculosis primarily attacks the lungs. It can spread from there to other organs. Pulmonary TB is curable with an early diagnosis and antibiotic treatment. Meanwhile the bacterium Mycobacterium tuberculosis causes tuberculosis (TB), a contagious, airborne infection that destroys body tissue.

Common symptoms include:

- cough up phlegm
- cough up blood
- have a consistent fever, including low-grade fevers
- have night sweats
- have chest pains

- have unexplained weight loss
- fatigue

TB is airborne, which means you can become infected with *M. tuberculosis* after breathing air exhaled by someone with tuberculosis. This can be air from:

- coughing
- sneezing
- laughing
- singing

The germs can stay in the air for several hours. It's possible to inhale them even when the infected person isn't in the room. But usually you have to be close to someone with TB for a long period of time to catch it.

## Epidemiology

While Epidemiology is the study of the distribution and determinants of health-related states or events (including disease), and the application of this study to the control of diseases and other health problems. Various methods can be used to carry out epidemiological investigations: surveillance and descriptive studies can be used to study distribution; analytical studies are used to study determinants.

According WHO (2018), the different mode of transmission of the infectious agent causing communicable diseases include:

- **Waterborne diseases:** transmitted by ingestion of contaminated water.
- **Foodborne diseases:** transmitted by the ingestion of contaminated food.
- **Airborne diseases:** transmitted through the air.
- **Vector-borne diseases:** transmitted by vectors, such as mosquitoes and flies.

Considering the findings above, Pulmonary Tuberculosis can be epidemiologically classified as airborne disease. This means that infectious agent are transmitted through the air to the susceptible person.

The main importance of epidemiologic classification of disease is to enable the development of prevention and control measures which are common to communicable diseases in the same class, so as to interrupt the mode of transmission. This is achieved through the following:

### I. Population or community health assessment.

Epidemiological investigation provides the necessary information required by public health officials to plan and implement health programs that will continue to maintain or improve the health conditions of the public. Through the descriptive and analytic epidemiology, officials can make informed decisions that will lead to improved health for the population they serve.

## II. Individual decisions.

Findings from epidemiological investigation helps to positive change the lifestyle and eating habit of individual. When they decide to stop smoking, take the stairs instead of the elevator, order a salad instead of a cheeseburger with French fries, or choose one method of contraception instead of another, they may be influenced, consciously or unconsciously, by epidemiologists' assessment of risk. These and hundreds of other epidemiologic findings are directly relevant to the choices that people make every day, choices that affect their health over a lifetime.

## III. Completing the clinical picture.

When studying a disease outbreak, epidemiologists depend on clinical physicians and laboratory scientists for the proper diagnosis of individual patients. But epidemiologists also contribute to physicians' understanding of the clinical picture and natural history of disease. (<http://www.ciphi.ca/hamilton/Content/documents/principles.pdf>)

## IV. Search for causes.

Most of the epidemiologic research is devoted to a search for causes, factors which influence one's risk of disease with a goal of identify a cause so that appropriate public health action might be taken.

3. Describe four or more bacterial vaccine-preventable diseases that have the same modes of transmission.

The four bacterial vaccine-preventable diseases include:

### i. Tuberculosis

TB is a contagious disease that is transmitted from person to person through coughing and breathing in airborne droplets that contain bacteria. TB primarily affects the lungs, but can affect any part of the body. As one of the most common infections in the world, TB remains a major problem in many countries and among vulnerable populations. TB is caused by slow-growing bacteria called *Mycobacterium tuberculosis*. When these bacteria enter the lungs, they are usually walled off into harmless capsules (granulomas) in the lung, causing infection but not disease.

Symptoms are usually mild and tend to present over a period of weeks, months, or sometimes years. TB disease symptoms are often initially mistaken for a smoker's cough, allergies, or chronic bronchitis from a lingering cold or flu infection. TB infection most often affects the lungs but can cause problems in other parts of the body. The classic symptoms of TB in the lungs include:

- Cough lasting more than three weeks
- Unexplained weight loss
- Low-grade fever
- Night sweats

TB is spread by tiny airborne droplets created by coughing. It is not spread by sharing food, utensils, drinks, touching, or having sex. Covering the mouth and nose when coughing is an important way to stop the spread of TB and other airborne diseases. If you have TB disease and are coughing, it is important to wear a mask and limit contact with others until your health care

provider tells you that you are no longer (<https://www.thoracic.org/patients/patient-resources/resources/tuberculosis.pdf>)

## ii. Diphtheria

Diphtheria is caused by *Corynebacterium* species, mostly by toxin-producing *Corynebacterium diphtheriae* and rarely by toxin-producing strains of *C. ulcerans* and *C. pseudotuberculosis*. The most common type of diphtheria is classic respiratory diphtheria, whereby the exotoxin produced characteristically causes the formation of a pseudomembrane in the upper respiratory tract and damages other organs, usually the myocardium and peripheral nerves. Acute respiratory obstruction, acute systemic toxicity, myocarditis and neurologic complications are the usual causes of death. The infection can also affect the skin (cutaneous diphtheria). More rarely, it can affect mucous membranes at other non-respiratory sites, such as genitalia and conjunctiva. *C. diphtheriae* is transmitted from person to person by intimate respiratory and direct contact. The incubation period of *C. diphtheriae* is two to five days (range 1– 10 days). A person is infectious as long as virulent bacteria are present in respiratory secretions, usually two weeks without antibiotics, and seldom more than six weeks.

([https://www.who.int/immunization/monitoring\\_surveillance/burden/vpd/WHO\\_SurveillanceVaccinePreventable\\_04\\_Diphtheria\\_R1.pdf?ua=1](https://www.who.int/immunization/monitoring_surveillance/burden/vpd/WHO_SurveillanceVaccinePreventable_04_Diphtheria_R1.pdf?ua=1)).

The symptoms of diphtheria usually begin two to seven days after infection. Symptoms of diphtheria include fever of 38 °C (100.4 °F) or above, chills, fatigue, bluish skin coloration (cyanosis), sore throat, hoarseness, cough, headache, difficulty swallowing, painful swallowing, difficulty breathing, rapid breathing, foul-smelling and bloodstained nasal discharge, and lymphadenopathy.<sup>[8][9]</sup> Within two to three days, diphtheria may destroy healthy tissues in the respiratory system. The dead tissue forms a thick, gray coating that can build up in the throat or nose.

Human-to-human transmission of diphtheria typically occurs through the air when an infected individual coughs or sneezes. Breathing in particles released from the infected individual leads to infection.<sup>[16]</sup> Contact with any lesions on the skin can also lead to transmission of diphtheria, but this is uncommon (<https://en.wikipedia.org/wiki/Diphtheria>)

## iii. Pertussis

Whooping cough is a bacterial upper respiratory infection that leads to episodes of violent coughing. The disease derives its name from the characteristic sound produced when affected individuals attempt to inhale; the *whoop* originates from the inflammation and swelling of the laryngeal structures (voice box) that vibrate when there is a rapid inflow of air during inspiration. The whoop is not often appreciated in infants and toddlers but will be recognized in older children, teens, and some adults (rarely). Infants and toddlers are more likely to have recurrent and frequent episodes of violent cough, which may cause facial cyanosis (blue skin discoloration) and rarely apnea (cessation of breathing). Whooping cough is highly contagious.

A bacterium known as *Bordetella pertussis* causes whooping cough infection. The bacteria attach to the lining of the airways in the upper respiratory system and release toxins that lead to inflammation and swelling.

Most people acquire the bacteria by breathing in the bacteria that are present in droplets released when an infected person coughs or sneezes. The infection is very contagious and is often spread to infants by family members or caregivers who may be in the early stages of infection and not realize that they are suffering from whooping cough.

The **first stage** of whooping cough is the catarrhal stage. In the catarrhal stage, which typically lasts from one to two weeks, an infected person has cold-like symptoms (characteristic of an upper respiratory infection), including

- runny nose,
- sneezing,
- low-grade fever, and
- mild, occasional cough, similar to the common cold.

The following characteristics describe the second stage:

- There are bursts (paroxysms) of coughing, or numerous rapid coughs, apparently due to difficulty expelling thick mucus from the airways in the lungs. Bursts of coughing increase in frequency during the first one to two weeks, remain constant for two to three weeks, and then gradually begin to decrease in frequency.
- At the end of the bursts of rapid coughs, a long inspiratory effort (breathing in) usually accompanies a characteristic high-pitched whoop sound for which the disease is named.
- During an attack, the individual may become cyanotic (skin and mucous membranes may turn blue) from lack of oxygen.
- Children and young infants appear especially ill and distressed.
- Vomiting (referred to by doctors as post-tussive vomiting) and exhaustion commonly follow the episodes of coughing.
- The person usually appears normal between episodes.
- Paroxysmal attacks occur more frequently at night, with an average of 15-24 attacks per 24 hours.
- The paroxysmal stage usually lasts from one to six weeks but may persist for up to 10 weeks.
- Infants under 6 months of age may not have the strength to have a whoop, but they do have paroxysms of coughing.

The **third stage** of whooping cough is the recovery or convalescent stage. In the convalescent stage, recovery is gradual. The cough becomes less paroxysmal and usually disappears over two to three weeks; however, paroxysms often recur with subsequent respiratory infections for many months.

([https://www.medicinenet.com/pertussis/article.htm#what\\_are\\_whooping\\_cough\\_symptoms\\_signs\\_and\\_stages](https://www.medicinenet.com/pertussis/article.htm#what_are_whooping_cough_symptoms_signs_and_stages))

#### iv. Pneumonia

Pneumonia is an infection in one or both lungs. It can be caused by bacteria, viruses, or fungi. Bacterial pneumonia is the most common type in adults. Pneumonia causes inflammation in the air sacs in your lungs, which are called alveoli. The alveoli fill with fluid or pus, making it difficult to breathe. Pneumonia symptoms can be mild to life-threatening. The most common symptoms of pneumonia can include:

- coughing that may produce phlegm (mucus)
- fever, sweating, and chills
- shortness of breath
- chest pain

#### Symptoms by cause

- Viral pneumonia may start with flu-like symptoms, such as wheezing. A high fever may occur after 12–36 hours.
- Bacterial pneumonia may cause a fever as high as 105°F along with profuse sweating, bluish lips and nails, and confusion.

#### Symptoms by age

- Children under 5 years of age may have fast breathing.
- Infants may vomit, lack energy, or have trouble drinking or eating.
- Older people may have a lower-than-normal body temperature.
- Pneumonia can be classified according to the organism that caused the infection.
- **Bacterial pneumonia:** The most common cause of bacterial pneumonia is *Streptococcus pneumoniae*. *Chlamydia pneumoniae* and *Legionella pneumophila* can also cause bacterial pneumonia.
- **Viral pneumonia:** Respiratory viruses are often the cause of pneumonia, especially in young children and older people. Viral pneumonia is usually not serious and lasts for a shorter time than bacterial pneumonia.
- **Mycoplasma pneumoniae:** Mycoplasma organisms are not viruses or bacteria, but they have traits common to both. Mycoplasmas generally cause mild cases of pneumonia, most often in older children and young adults.
- **Fungal pneumonia:** Fungi from soil or bird droppings can cause pneumonia in people who inhale large amounts of the organisms. They can also cause pneumonia in people with chronic diseases or weakened immune systems.
- One kind of fungal pneumonia is called *Pneumocystis jirovecii* pneumonia (PCP). This condition generally affects people with weakened immune systems, such as those with AIDS. In fact, PCP can be one of the first signs of infection with AIDS.

Both viral and bacterial pneumonia can spread to others through inhalation of airborne droplets from a sneeze or cough. But while you can become infected with fungal pneumonia from the environment, it doesn't spread from person to person.



(<https://www.healthline.com/health/pneumonia>)

4. What are the causes and methods for preventing bacterial meningitis?

Common causes of bacterial meningitis vary by age group:

- **Newborns:** Group B *Streptococcus*, *Streptococcus pneumoniae*, *Listeria monocytogenes*, *Escherichia coli*
- **Babies and children:** *Streptococcus pneumoniae*, *Neisseria meningitidis*, *Haemophilus influenzae* type b (Hib), group B *Streptococcus*
- **Teens and young adults:** *Neisseria meningitidis*, *Streptococcus pneumoniae*
- **Older adults:** *Streptococcus pneumoniae*, *Neisseria meningitidis*, *Haemophilus influenzae* type b (Hib), group B *Streptococcus*, *Listeria monocytogenes* (<https://www.cdc.gov/meningitis/bacterial.html#causes>)

The most effective way to protect you and your child against certain types of bacterial meningitis is to get vaccinated. There are vaccines for three types of bacteria that can cause meningitis:

- *Neisseria meningitidis*
- *Streptococcus pneumoniae*
- Hib

Make sure you and your child are vaccinated on schedule.

Like with any vaccine, the vaccines that protect against these bacteria are not 100% effective. The vaccines also do not protect against all the types (strains) of each bacteria. For these reasons, there is still a chance you can develop bacterial meningitis even if you were vaccinated. Pregnant women can also reduce their risk of meningitis caused by *Listeria monocytogenes*. Women should avoid certain foods during pregnancy and safely prepare others. The CDC recommends prophylaxis for:

- Close contacts of someone with meningitis caused by *Neisseria meningitidis*
- Family members, especially if they are at increased risk, of someone with a serious Hib infection

One can be protected from bacterial meningitis by maintaining healthy habits such as:

- Don't smoke and avoid cigarette smoke
- Get plenty of rest
- Avoid close contact with people who are sick

5. Explain two characteristics that illustrate how the Anopheles larvae are different from other mosquito larvae. Using illustration is advised




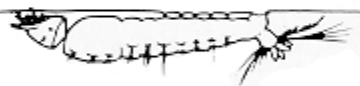
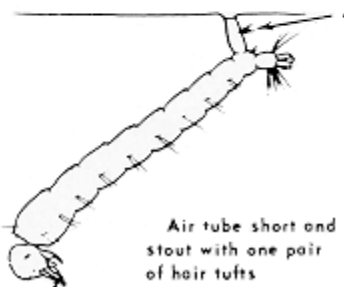
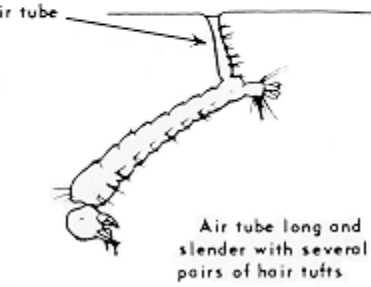
There are two common types of mosquitoes that lay their eggs in water: anophelines, which can be vectors of malaria, and culicines, which do not carry malaria. The differences in the body structure and resting position in water collections of the anopheline and culicine larvae, as illustrated in Figures below. Other differentiating features illustrated in the diagrams below include:

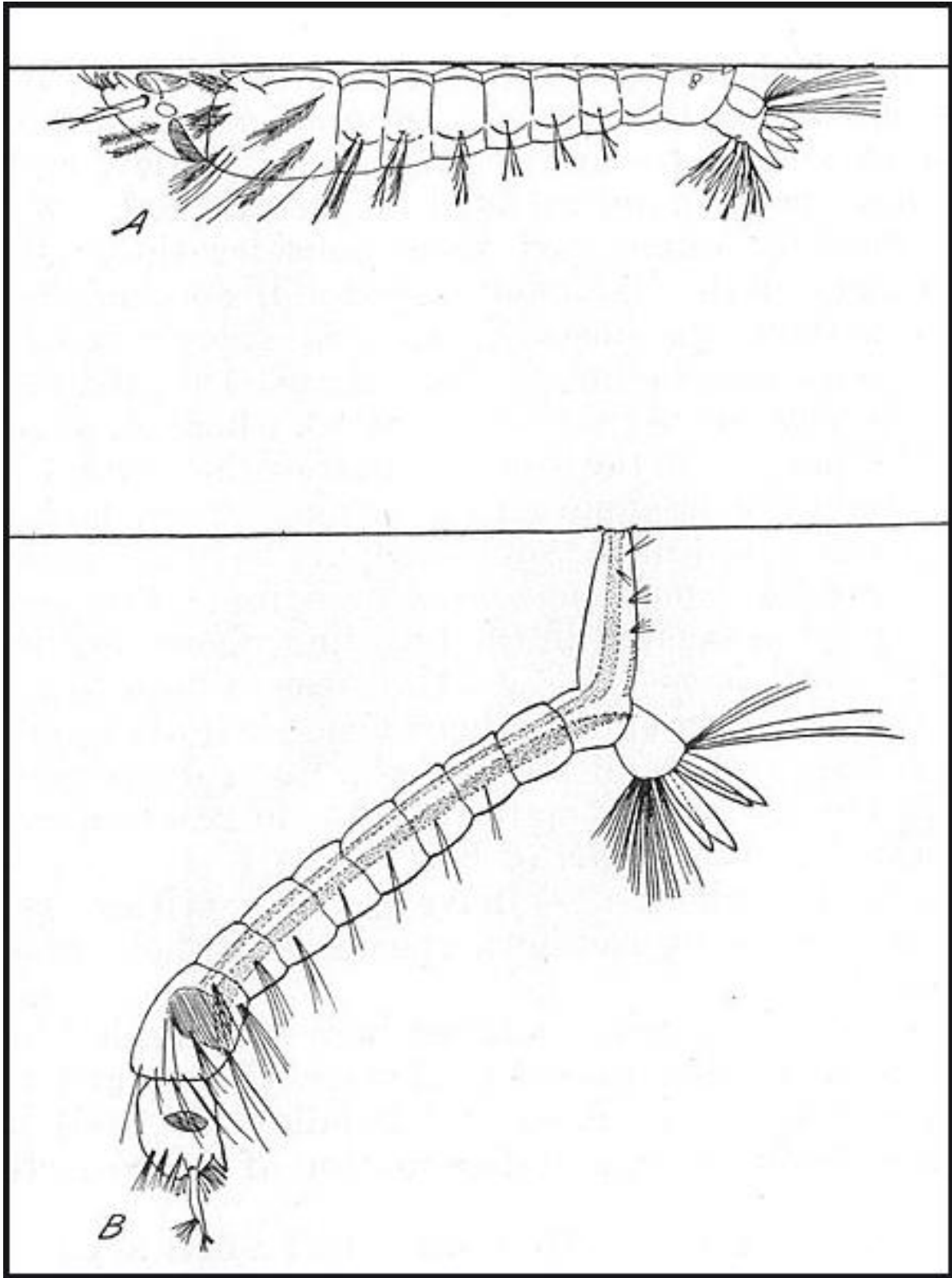
Anopheles Larva:

1. Rest parallel to the water surface and the head rotate 180° when feeding
2. No air tube

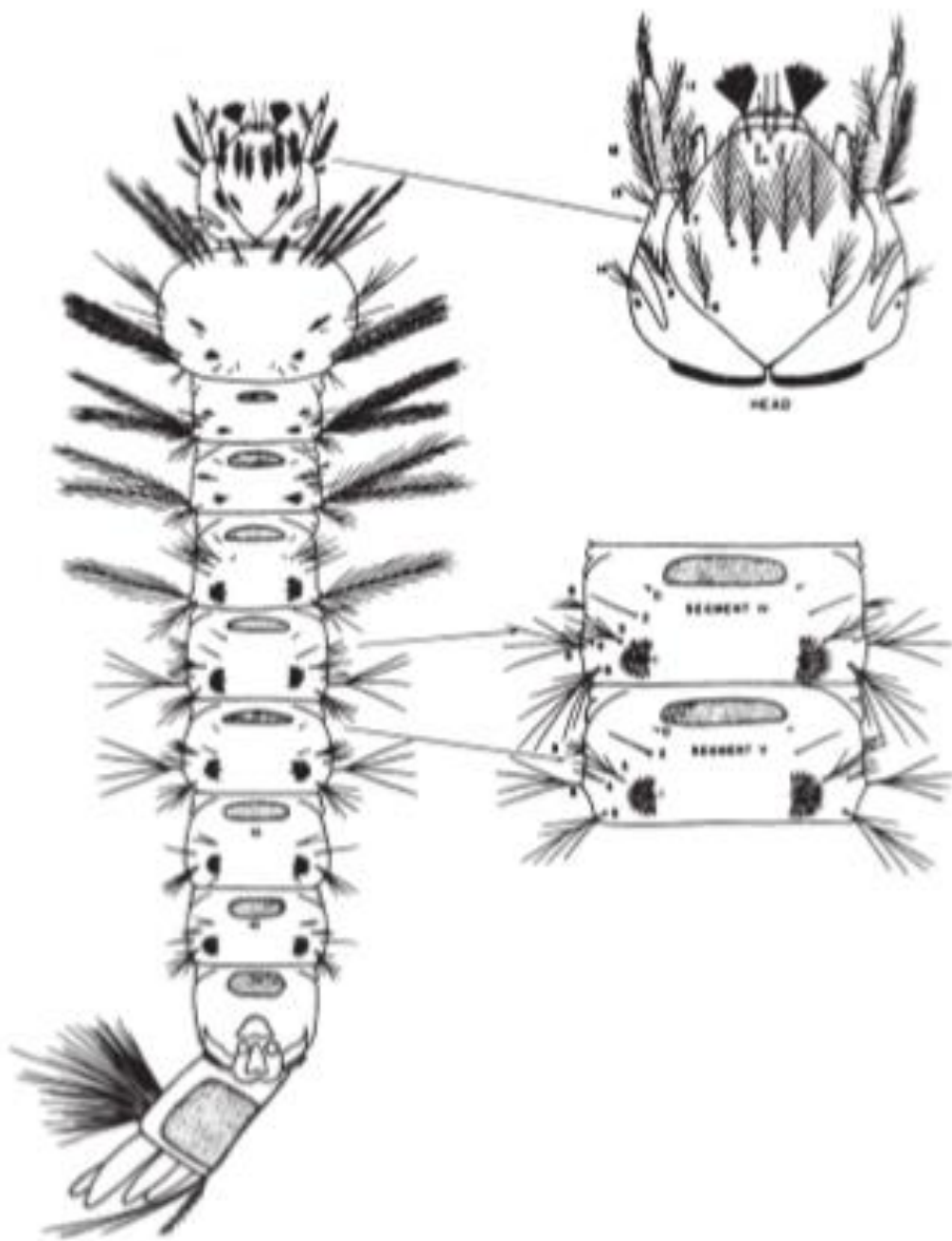
For others:

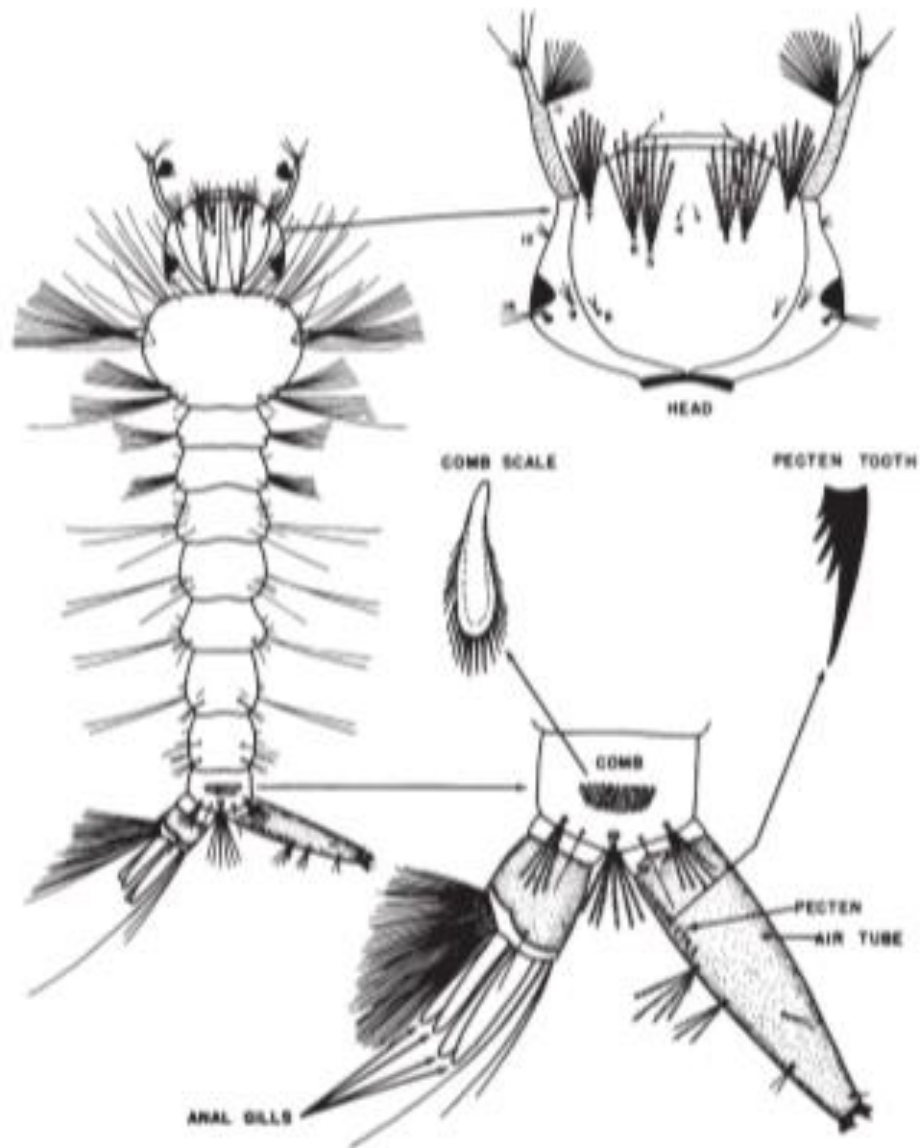
1. Rest at an angle to the surface of the water
2. There is air tube which maybe long or stout with one or several pairs of hair tufts

ANOPHELES	AEDES	CULEX
<b>EGGS</b>		
 Laid singly      Has floats	 Laid singly      No floats	 Laid in rafts      No floats
<b>LARVAE</b>		
 Rest parallel to water surface No air tube Head rotated 180° when feeding	 Rest at an angle Air tube Air tube short and stout with one pair of hair tufts	 Rest at an angle Air tube Air tube long and slender with several pairs of hair tufts



An image from Wikipedia: Feeding positions of mosquito (family Culicidae) larvae: A, Anopheles (subfamily Anophelinae); B, Culex (subfamily Culicinae)





[https://www.cdc.gov/nceh/ehs/docs/pictorial\\_keys/mosquitoes.pdf](https://www.cdc.gov/nceh/ehs/docs/pictorial_keys/mosquitoes.pdf)

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