

Insect-borne bacterial diseases of Human

RAMESH C. BHAGAT

Department of Zoology, University of Kashmir, Srinagar, KASHMIR (J&K) INDIA

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The important bacterial diseases of human beings, viz. Anthrax Botulism, Cholera, Conjunctivitis (epidemic), Dysentery, Diphtheria, Enteric fever, Gastro- enteritis, Leprosy, Trachoma, Tuberculosis, Tularaemia and Yaw's disease, are mechanically transmitted by different species of insects directly or indirectly. In these diseases, various insect species, known as vectors obtain pathogenic bacteria from human faeces, urine, blood, superficial ulcers or exudates. The disease- causing bacteria may be transferred to human by vectors indirectly through human food or water by contact or regurgitated or deposited together with vector's faecal matter. The pathogenic bacteria may also be acquired by human through direct contact. Human diseases such as: Plague; Rickettsial diseases such as Epidemic Typhus, Trench fever, Murine Typhus, Carrion's disease; Spriochaetal diseases like Epidemic Relapsing fever, are biologically transmitted by various insect vectors, with multiplication of pathogenic bacteria taking place in the insect vector species.

Mechanically transmitted diseases:

The different insect-borne bacterial diseases of public health importance, transmitted mechanically, are given below in Table 1, indicating type of disease, causative agents(bacterial species) and insect vector species.

Biologically transmitted diseases:

Plague:

Plague is a dangerous disease of human beings and rodents, caused by the bacterium, *Yersinia pestis*, transmitted between rats and from rats to human beings by insect vector, rat fleas (*Xenopsylla* spp.) The fleas are resistant to the disease and have maintained the plague causing agent throughout the centuries, are responsible of number of epidemics and pandemics in the world.

The main insect vector of human plague is oriental rat flea, *Xenopsylla cheopis*. There are four forms of human plague: (a) bubonic; (b) septicaemic; (c) pneumonic and (d) meningial plague. In bubonic plague, the disease causing bacteria are largely contained in painful swelling of local lymph glands nodes in groin, armpit or neck region of an individual, known as buboes. In the later stage of

disease the bacterium become abundant in circulating blood and are readily available to blood sucking fleas. To infect fleas successfully, a high level of bacteraemia is required. This type of plague is called as septicaemic plague. In this stage of disease, the patient suffers from chill, fever, prostration and death may occur. Thereafter, the bacteria attacks lungs called as pneumonic plague. This form of plague is highly contagious, transmitted human to human by bacterial aerosol and spread through coughing.

Epidemic typhus:

Epidemic typhus is a fatal disease of man, transmitted by human body louse *Pediculus humanus* and the causative agent of this disease is a rickettsian, viz., *Rickettsia prowazekii*. This disease is characterized by high fever, eruptive rashes, purplish spotting of the skin, severe nervous and gastro-intestinal symptoms, occurrence of microscopic nodules around arterioles and great reduction of leucocytes. The transmission of typhus in human results due to contamination of bites or scratches by faeces or from inhalation of dried faeces of lice.

In olden days, typhus broke out frequently on sailing ships or prison and that is why it was sometimes called as "jail" or "ship fever", hence the name epidemic typhus. When there is recrudescence of epidemic typhus among persons who have recovered from this disease, it is known as Brill-Zinsser's disease or endemic form of typhus, occurring in absence of body lice.

Trench fever:

It is also called as five- day fever, caused by *Rochalimaea quintana* (Rickettsia) and transmitted by human louse, *Pediculus humanus*. Trench fever is not a fatal disease. The louse acquires the pathogens when feeding on blood of an infected person. The mode of transmission of *R. quintana* is through faecal matter of the louse. The symptoms of this disease include headach, body pain, high fever, albumin in urea, with usually a rash.

Murine typhus:

The causative agent of this disease is *Rickettsia*

Table 1 : Mechanically transmitted diseases by insect vectors

Sr. No.	Type of disease	Caustive agent(s)	Insect vector(s)
1.	Anthrax	<i>Bacillus anthracis</i>	Horseflies (<i>Tabanus</i> spp. Stableflies (<i>Stomoxys</i> spp.) and Houseflies (<i>Musca</i> spp.),
2.	Botulism	<i>Clostridium botulinum</i>	Transmitted by larvae and adults of cheese skippers (<i>Piophilidae casei</i>).
3.	Cholera	<i>Vibrio cholera</i>	Houseflies, cockroaches may contaminate human food after feeding on faeces of an infected person.
4.	Conjunctivitis (epidemic)	<i>Haemophilus aegypticus</i> (Koch-week bacillus)	Eyegnats (<i>Hippelates</i> spp.) and eye flies (<i>Siphunculina-</i> spp.) <i>H. pusia</i> in USA and <i>S. funicola</i> in Oriental region.
5.	Dysentery	<i>Shigella dysenteriae</i> , <i>S. flexneri</i> and <i>S. boydii</i> (in eastern region); <i>S. sonnei</i> and <i>S. flexneri</i> (in Western region)	Blow flies (<i>Calliphora</i>); Muscid flies (<i>Fannia</i> spp.) and Houseflies. Flies carry pathogenic bacilli from faecal matters to food/ water of a person.
6.	Diphtheria	<i>Corynebacterium diphtheria</i>	Houseflies are the main vectors of the disease
7.	Enteric fevers a)Typhoid b)Paratyphoid	<i>Salmonella- typhi</i> <i>Salmonella paratyphi</i>	Transmitted mainly by houseflies, cockroaches and other insects from human faeces and urine of an infected person to food.
8.	Food poisoning (Gastroenteritis)	<i>Salmonella enteritidis</i> and <i>S. typhimurium</i>	Disease transmitted through houseflies.
9.	Gastroenteritis	<i>Escherichi coli</i>	Flies, viz. <i>Lucila sericata</i> (blowfly); Houseflies; <i>Fannia canicularis</i> and <i>F. scalaris</i> (Muscidflies), carry <i>E. coli</i> from faeces to food material of human
10.	Leprosy	<i>Mycobacterium leprae</i>	Houseflies are the main insect vector of the disease
11.	Trachoma	<i>Chlamydia trachomatis</i>	It is transmitted mechanically by houseflies in different parts of the world
12.	Tuberculosis (T. B)	<i>Mycobacteria tuberculosis</i>	T.B. is transmitted through houseflies.
13.	Tularaemia	<i>Francisella, tularensis</i>	Tabanid flies, viz. <i>Chrysops discalis</i>
14.	Yaw'a disease (Framboesia)	Spirochaete- <i>Trepanonema pertenu</i>	It is mechanically transmitted by muscid flies and eye flies, viz. <i>Siphunculina funicola</i> in oriental region and <i>Hippelates pusia</i> in Southern States of U.S.A

mosseri, transmitted mainly by rat-flea, *Xenopsylla cheopis* in human being, primarily from rats. It has been observed that after initial infection by rat-flea, this disease many spread from person to person by lice. Murine typhus is less severe than epidemic typhus and is probably universal in tropical and subtropical regions of the world.

Carrion's disease (Oroya fever, verruga peruana):

This fatal disease of man is caused by a rickettsian,

viz., *Bartonella baccilliformis*, transmitted among human beings by sandfly, *Lutzomyia verrucarum*. This disease is restricted to high mountain valley in western and central Cordilleras of Andes (Peru), Ecuador and Columbia. *B. baccilliformis* is responsible for causing two different disease in man as: progressive anaemia, referred to as oroya fever and more chronic cases of eruption of cutaneous nodules, called as verruga peruana. These two different kinds of diseases are jointly known

as Carrion's diseases.

Epidemic relapsing fever:

This disease is transmitted by body- louse, *Pediculus humanus* and also ticks of the genus, *Ornithodoros*.

Epidemic relapsing fever is caused by a spirochaete, *Borrelia recurrentis*. This disease was earlier widely

distributed throughout the world, however, now it is rare. Relapsing fever is characterized by recurring fever and chills, with aches and pains, accompanied by haemorrhage into skin, anaemia and jaundice.

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