UNIVERSITAS INDONESIA
Veritas, Probitas, Iustitia
FACULTY OF PUBLIC HEALTH

Vectors and Disease-Carrying Animals

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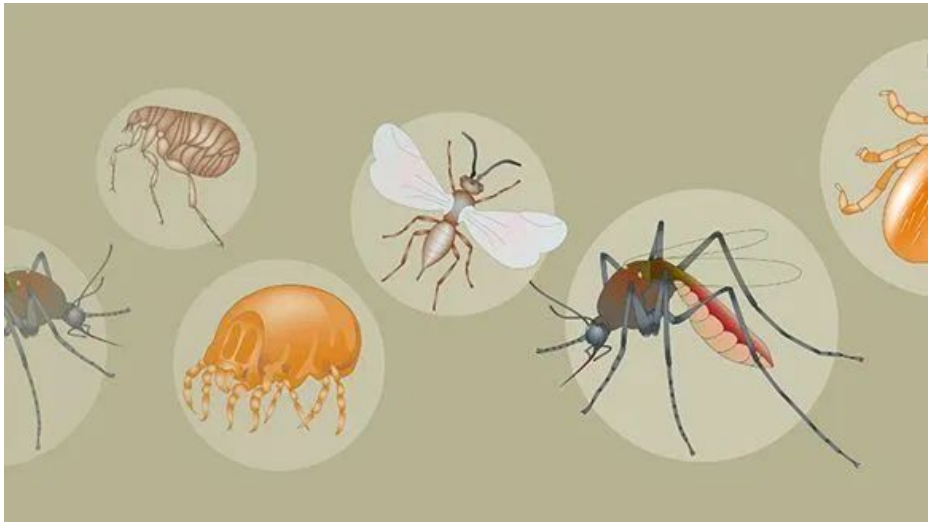
Photo Credit: Centers for Disease Control and Prevention. Available at: https://www.cdc.gov/ncezid/dvbd/index.html

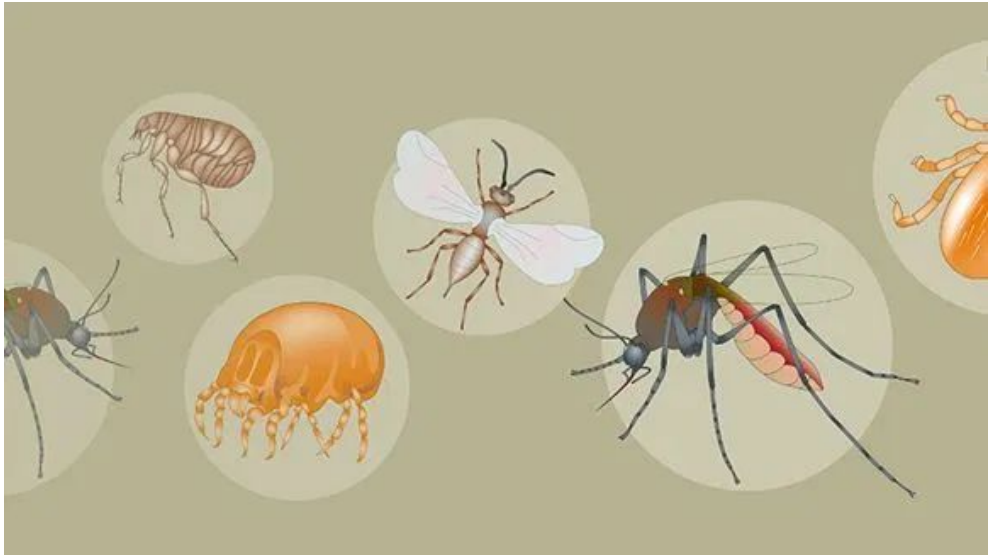
Vectors



A vector may be any arthropod (insect or arachnid) or animal which carries and transmits infectious pathogens directly or indirectly from an infected animal to a human or from an infected human to another human. This can occur via biting (e.g. mosquitoes, tsetse flies), penetration (e.g. guinea worm), or the gastrointestinal tract (e.g. contaminated food or drink).

The European Commision (2005). *Main Vectors* [online]. Available at: https://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/WEDC/evc/evc-02.pdf
Whitney D.I Makokha. (2020). Vector-Borne Disease: Mosquitoes. [online]. available at: https://wdimakokha.com/portfolio/mosquito-borne-diseases-a-global-pandemic/

Vectors



Biting

Penetration

Gastrointestinal tract

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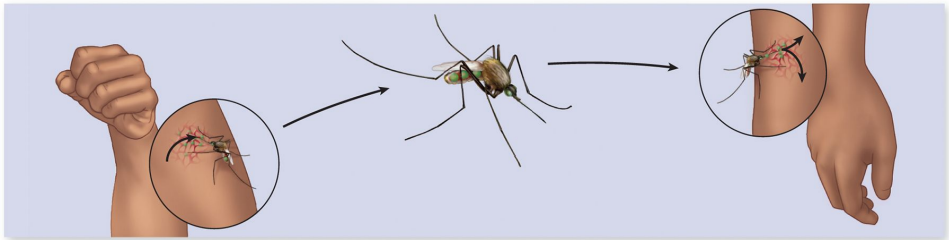
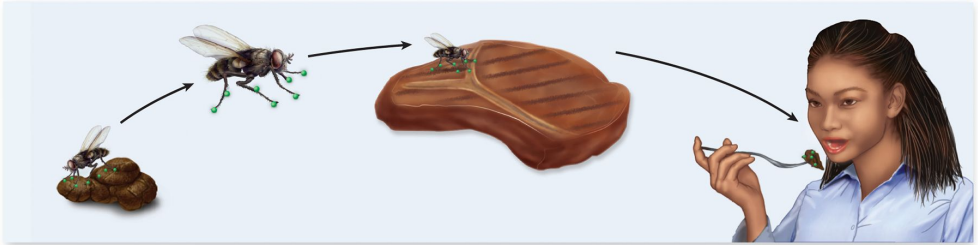
Several Terms in Vectors

Biological Vectors



Mechanical Vectors



The European Commision (2005). *Main Vectors.* [online]. Available at: https://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/WEDC/evc/evc-02.pdf
European Food Safety Authority (n.d). *Vector-borne diseases* [online]. Available at: https://www.efsa.europa.eu/en/topics/topic/vector-borne-diseases#:~:text=Biological%20vectors%2C%20such%20as%20mosquitoes,transmit%20them%20through%20physical%20contact.
Photo Credit: https://www.pinterest.com/pin/419679259024509529/

Vector-borne Diseases

Vector		Disease caused	Type of pathogen
Mosquito	*Aedes*	Chikungunya	Virus
		Dengue	Virus
		Lymphatic filariasis	Parasite
		Rift Valley fever	Virus
		Yellow Fever	Virus
		Zika	Virus
	Anopheles	Lymphatic filariasis	Parasite
		Malaria	Parasite
	Culex	Japanese encephalitis	Virus
		Lymphatic filariasis	Parasite
		West Nile fever	Virus
Aquatic snails		Schistosomiasis (bilharziasis)	Parasite
Blackflies		Onchocerciasis (river blindness)	Parasite
Fleas		Plague (transmitted from rats to humans)	Bacteria
		Tungiasis	Ecto parasite
Lice		Typhus	Bacteria
		Louse-borne relapsing fever	Bacteria
Sandflies		Leishmaniasis	Bacteria
		Sandfly fever (phlebotomus fever)	Virus
Ticks		Crimean-Congo haemorrhagic fever	Virus
		Lyme disease	Bacteria
		Relapsing fever (borreliosis)	Bacteria
		Rickettsial diseases (eg: spotted fever and Q fever)	Bacteria
		Tick-borne encephalitis	Virus
		Tularaemia	Bacteria
Triatome bugs		Chagas disease (American trypanosomiasis)	Parasite
Tsetse flies		Sleeping sickness (African trypanosomiasis)	Parasite

WHO (2020). *Vector-borne Disease* [online]. Available at: https://www.who.int/news-room/fact-sheets/detail/vector-borne-diseases

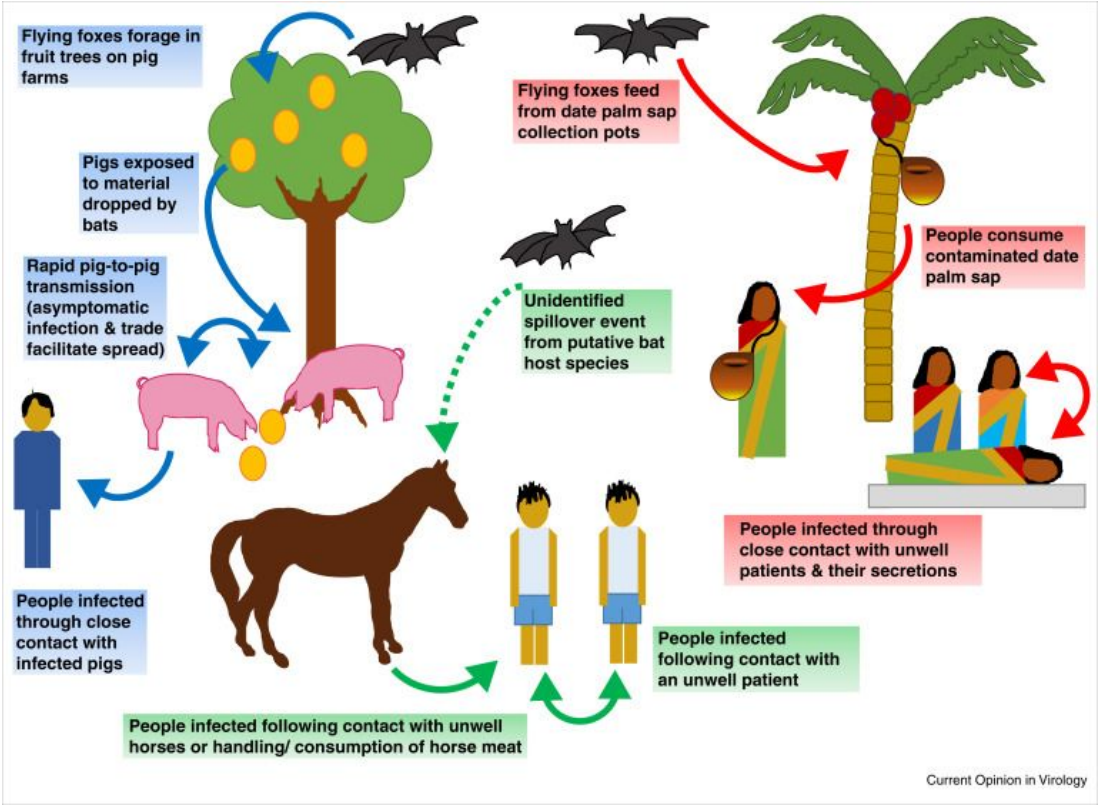
Emerging Infectious Diseases

A disease that appears in a population for the first time, or

Disease that may have existed previously but is rapidly increasing in incidence or geographic range

European Food Safety Authority (n.d). *Vector-borne diseases* [online]. Available at: https://www.efsa.europa.eu/en/topics/topic/vector-borne-diseases#:~:text=Biological%20vectors%2C%20such%20as%20mosquitoes,transmit%20them%20through%20physical%20contact

Zoonotic Diseases



Clayton, B.A. (2017). *Nipah virus: transmission of a zoonotic paramyxovirus.* Available at: https://www.sciencedirect.com/science/article/pii/S1879625716302097

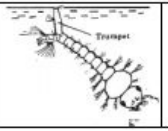
Main vectors involved in vector-borne diseases epidemics

Mosquitoes

Genus	Breeding site	Place found	Disease and distribution
Anopheline mosquitoes Anophelines breed in non polluted water Biting period : NIGHT	edges of rivers, swamps, impoundments, ditches, tanks, saltwater habitats protected from wave action, rice fields, temporary rainpools, hoofprints.	Worldwide	▪ Malaria: Tropical and sub-tropical areas ▪ Bancroftian filariasis: Asia and Africa ▪ Brugian filariasis: Asia ▪ O'nyong nyong virus: Africa
Aedes mosquitoes One species lives in close association with man, in any kind of human settlement. The *A. aegypti* breeds in any small water collection. Aedes spp. are primarily forest mosquitoes. Biting period : DAY	Tin cans, plastics, car tyres, gutters, ornamental ponds, tanks, jars, any type of container, waste disposal areas, tree holes.	Worldwide	▪ Yellow fever: Africa and Americas ▪ Dengue: Africa, Americas, Asia ▪ Dengue Haemorrhagic fever: Americas, Asia ▪ Bancroftian filariasis: Pacific ▪ Other arbovirus: Africa, Americas, Asia
Culex mosquitoes *C. quinquefasciatus* breed in any dirty water in urban and rural areas. Other species are also very common in rice fields in Asia. Biting period : NIGHT	*C. quinquefasciatus* Waste water ditches, latrines, septic pits, cesspools, drains, waste disposal.	Worldwide	▪ Bancroftian filariasis: Most tropical areas ▪ Encephalitis virus: Africa, Americas, Asia, Europe
Mansonia mosquitoes Mainly associated with aquatic plants, in rural areas where irrigation canals occur. Biting period : NIGHT It is a vicious biter	Ditches, ponds, irrigation canals, swamps.	Essentially tropical Worldwide	▪ Brugian filariasis: Asia ▪ Other arbovirus: Rare in Africa and Americas

The European Commision (2005). *Main Vectors* [online]. Available at: https://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/WEDC/evc/evc-02.pdf

Characteristics of the different life stages of the mosquito

SUBFAMILIES			
Anopheline	**Culicine**		
Genus Anopheles	Genus Aedes	Genus Culex	Genus Mansonia
Eggs			
 float	 do not float	 raft of 25 - 100 eggs	 Aquatic plant
Larval stage			
			
Pupal stage			
			
Adult stage			
 Long palps	 Short palps		

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Main vectors involved in vector-borne diseases epidemics

Pediculus humanus humanus
(Body louse)

Body Louse

- The body louse is responsible for the transmission of typhus
- The body louse is found attached to clothing in close contact with the skin.

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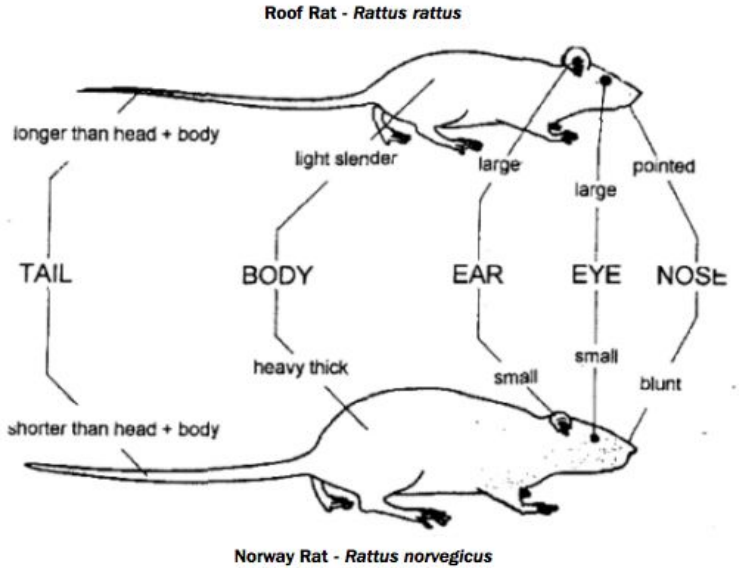
Main vectors involved in vector-borne diseases epidemics

Rodents

Species	*Rattus norvegicus*	*Rattus rattus*	*Mus musculus*
Other name	Brown rat or Norway rat	Roof rat or Black rat	House mouse
Weight	500 g	250 g	20 g
Length	45 cm	40 cm	18 cm
Habitat	Principally in sewers and holes and feeds on garbage.	Under the roof of any type of building.	Around supplies of grain, cereals, and flour.



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Vector and animal-carrying diseases management

Vector control is all activities or actions that are aimed at lowering the vector population as low as possible so that its existence is no longer at risk for its occurrence transmission of vector-borne diseases in an area or avoidance public contact with vectors so transmission of disease vector borne can be prevented.

Integrated Vector Control is an approach that uses a combination of several vector control methods that are based on the principles of security, rationality and effectiveness of its implementation as well as taking into account the sustainability of its success.

Peraturan Menteri Kesehatan Republik Indonesia Nomor 374 Tahun 2010 tentang Pengendalian Vektor

Methods of Vector Management

Physical & Mechanical

Biology

Chemical

Regulation of the Minister of Health of the Republic of Indonesia Number 374 of 2010: Vector Control

Zoonotic disease management

Safe and appropriate guidelines for animal care in the agricultural

Standards for clean drinking water and waste removal

Education campaigns to promote handwashing after contact with animals

WHO (2020). *Zoonoses*. Available at: https://www.who.int/news-room/fact-sheets/detail/zoonoses