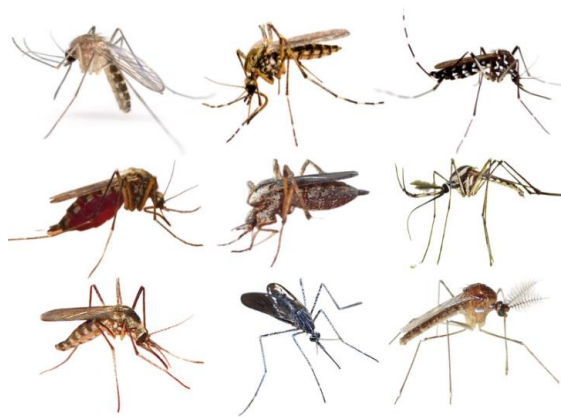


Mosquitos

As our long hot summer of 2026 comes to an end, the welcome return of rains have been accompanied by the surge in the numbers of mosquitos in our gardens and homes. The Somerset Levels are known for their stable mosquito populations, including marsh species, and can see local explosions after summer flooding. The best months to visit with fewer mosquitoes are March, April, October, and November. The peak mosquito season is from June to September, with evenings near water carrying a steady bite risk through summer.



Mosquitoes belong to the family Culicidae, which includes over 3,500 species. The Anophelinae subfamily is home to the Anopheles genus, responsible for malaria transmission, while the Culicinae subfamily includes Aedes, Culex, and other genera. Anopheles mosquitoes are found in sub-Saharan Africa, preferring shallow water for egg-laying. Aedes mosquitoes, such as the Aedes albopictus (Asian Tiger Mosquito), are day-biting and found in coastal areas. Culex mosquitoes, like the Culex pipiens (Common House Mosquito), are nocturnal and found in temperate regions.

The distribution of mosquitoes in Europe is significantly influenced by global warming. As temperatures rise, mosquitoes are expanding their geographical range and breeding season. This has led to an increase in the spread of mosquito-borne diseases across the continent. Malaria was last known to be endemic within the UK in the period between 1917 and 1921 in Kent. Most cases were concentrated on the Isle of Sheppey, the Isle of Grain, and Sandwich, where troops and civilians living locally, who had never been abroad.



GB War Office, anti-malaria detachment, Sandwich. Credit: Wellcome Collection.

Controlling the outbreak took considerable effort. Insecticides were used, and areas of standing water cleared.

With climate change caused by our use of fossil fuels, there is a changing pattern of distribution of mosquitos around Europe. Warmer conditions create opportunities for mosquito populations to remain active for longer. *Aedes aegypti* (yellow fever mosquito), normally associated with tropical and subtropical regions, was found breeding inside homes in east London in September 2026. The European Centre for Disease Prevention and Control (ECDC) reports that *Aedes albopictus*, commonly known as the (Asian tiger mosquito), has continued to expand northwards and westwards in Europe.

Already, in regions like Romania, where the *Aedes albopictus* mosquito is establishing itself, they are known to be able to transmit diseases like dengue and chikungunya fever. The West Nile virus, is also circulating in the region due to warmer conditions.

International travel can introduce infected people and mosquitoes. Additionally, trade and the movement of goods can transport mosquito eggs and larvae. Standing water then provides breeding sites. Together, these factors can help mosquitoes establish in places where warmer temperatures have made survival easier.



Mosquitoes depend on water for their entire early life cycle, including the egg, larval, and pupal stages. Female mosquitoes lay eggs on the surface of water or in damp areas that may later flood, allowing the eggs to hatch into larvae. These larvae, often called "wigglers," are fully aquatic and must periodically rise to the surface to breathe through specialized tubes called siphons. Without water, mosquitoes cannot complete their life cycle or reproduce effectively.

Moving water disrupts their ability to breathe at the surface, often causing larvae to drown. This makes fountains, streams, or aerated ponds less suitable for mosquito breeding. Even small amounts of standing water, such as in bottle caps, buckets, or plant saucers, can support thousands of eggs, highlighting how easily mosquitoes can proliferate in calm water.

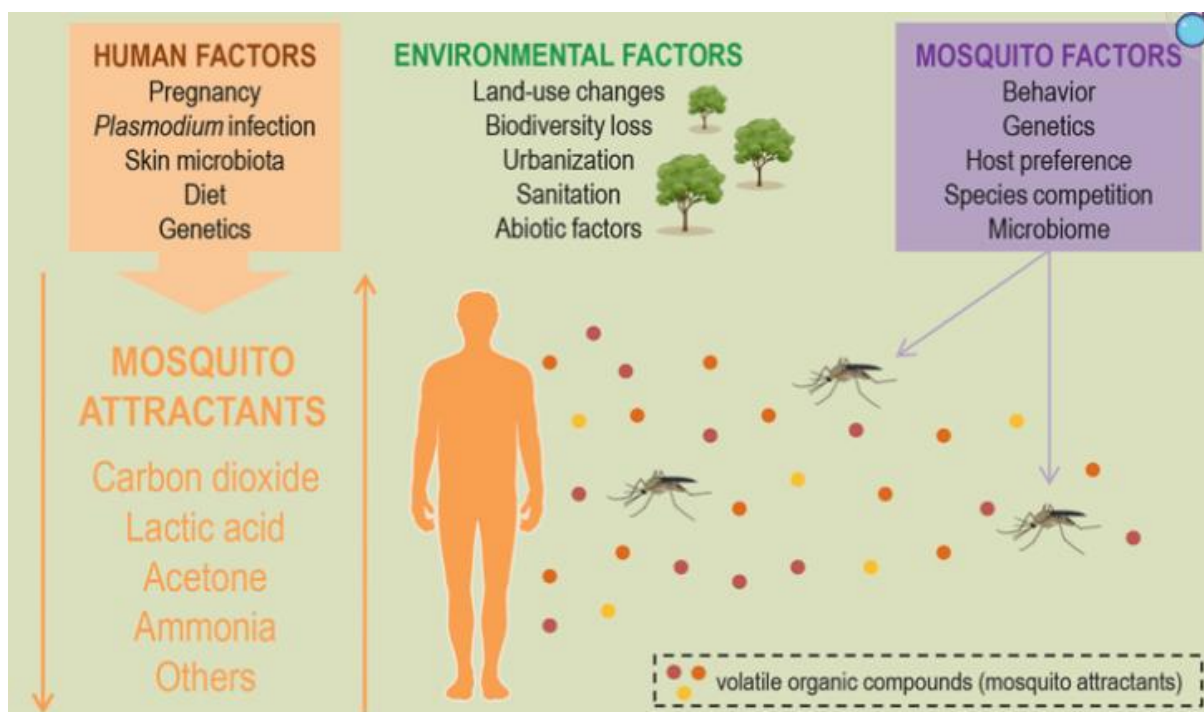
Whether a person gets bitten depends on numerous factors. Some species of mosquito will bite any animal they find, others prefer humans. Blood-feeding mosquitoes locate humans by detecting a combination of human-derived chemical signals, including carbon dioxide, lactic acid, and other volatile organic compounds. Interestingly, not all humans suffer from mosquito bites with the same frequency or intensity.

Some individuals are more attractive to mosquitoes than others, and this has an important impact on the risk of infection by pathogens transmitted by these vectors, such as arboviruses and malaria parasites.



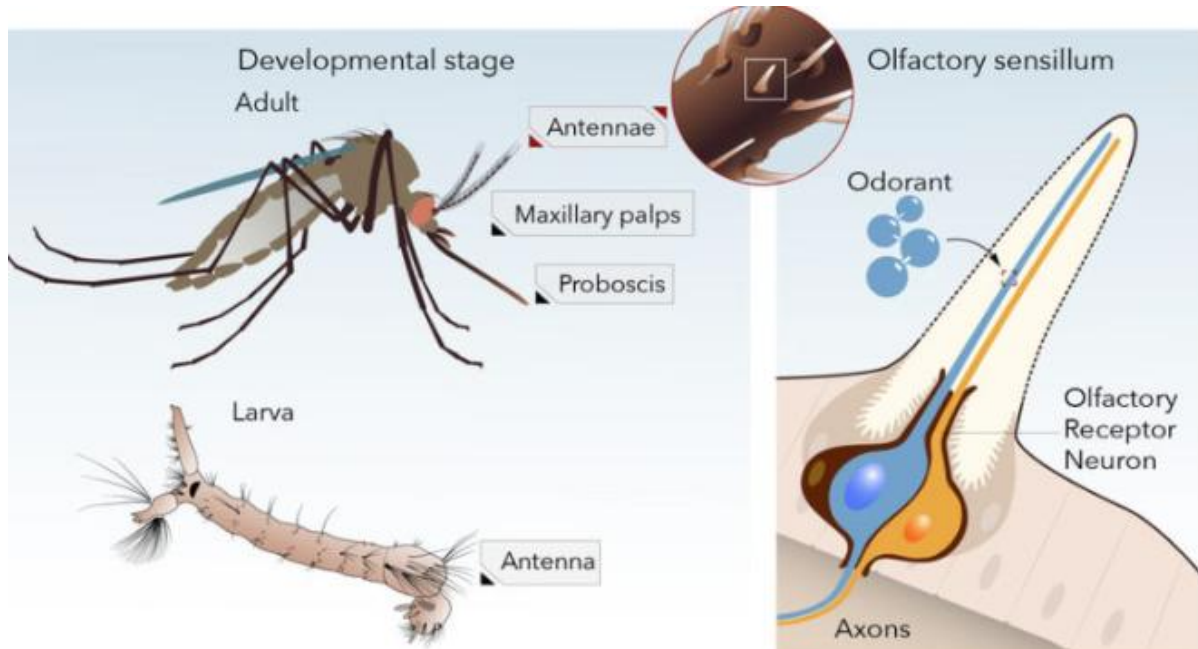
Variability in human attractiveness to mosquitoes is partially due to individual characteristics in the composition and intensity in the release of mosquito attractants. The factors that determine these particularities are diverse, modestly understood and still quite controversial.

In brief, pregnancy and malaria (*Plasmodium*) infection increase the our attractiveness to mosquitoes. Skin microbiota and human genetics modulate the production of mosquito attractants and therefore influence individual susceptibility to these insects. Of these, the billions of bacteria and fungi species that cover our skin are possibly a more important factor that we have previously known.

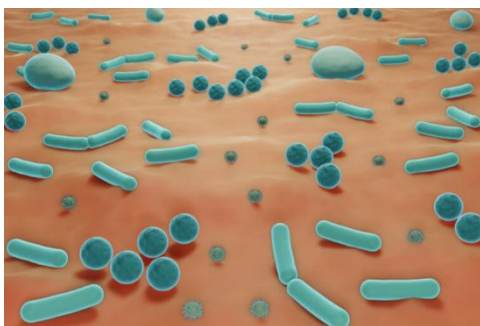


There is great variability in the release of mosquito attractants between individuals.

Carbon dioxide (CO₂), lactic acid, acetone, and ammonia are some of the most well-known volatile human-derived signals used by mosquitoes to locate humans. Kairomones (mosquito attractants) are detected by mosquitoes through sensory (olfactory) receptors found in the antennae, labellum and maxillary palps.



Different human individuals generally produce similar types of volatile compounds and the amount of those compounds emanating from human skin varies. Our sweat is actually odourless. It is the presence of different combinations of bacteria that give each of us a unique smell. No one is exactly the same and it is as unique as a fingerprint.



Skin microbiota influences the release of mosquito attractants because the bacteria metabolize the volatile products released by sebaceous glands. Sebaceous glands are microscopic glands in the skin that produce sebum, an oily substance essential for skin and hair health. Our eccrine sweat glands are the primary sweat glands responsible for

thermoregulation, producing a watery, odourless sweat that cools the body through evaporation.

Therefore, differences in the individual skin microbiota can be translated into differences in the odour signature of each individual, modifying the composition and intensity of kairomones released into the air.

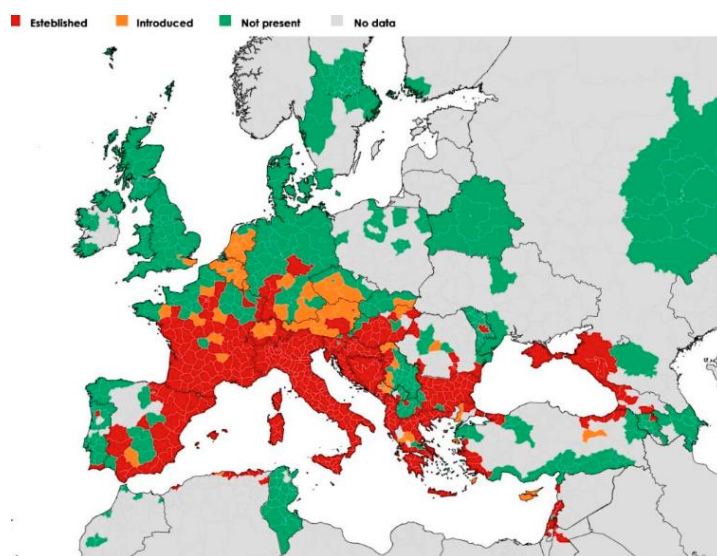
Heat and carbon dioxide production is also a factor that comes not play. Pregnant women probably release greater amounts of mosquito attractants (e.g. CO₂) due to the higher metabolic rate and heat production observed during pregnancy .Unfortunately for those already infected by malaria, they become even more attractive to mosquitos. Various mechanisms have been put forward but it remains a bit of a mystery.

Vitamin B supplementation and garlic consumption have been suggested as mosquito repellent strategies, especially in popular media. However, in a controlled study no effect of vitamin B supplementation on human attractiveness or repellence was noted.

Alcohol consumption also increases human attractiveness to some species of mosquito. It is potentially due to changes in body odour caused by alcohol metabolism. Beer was the source of alcohol in the studies and it was concluded that there is some evidence showing that beer consumption could be a risk factor for mosquito bites and, consequently, malaria and infection by arboviruses. Similarly, bananas alter our human odours to a degree but do not seem to be an effective repellent.

Studies of twins are frequently used to see if genetics have a part to play. For instance, the minute differences by mutation of the *ABCC11* gene affects the production of human armpit odour. However it remains the individual pattern of the bacterial microbiome on the skin of each twin that has the most influence on their attractiveness to a mosquito.

From the public health perspective, the variability in human susceptibility to mosquitoes may impact the risk of infection by mosquito-borne diseases in endemic areas. Our risk is increasing and management of waterways and how we deter mosquito bites is going to be a matter of increasing importance in the coming years.



Distribution of the Tiger Mosquito, *Aedes albopictus*, in 2019 -a known vector of chikungunya and dengue viruses (from ECDC 2019).

We are used to being given malaria prophylaxis for travel to Africa and the far East. Soon we will have to consider it for parts of Europe.

Peter Smith Sept 2026