

RABIES

IN EUROPEAN BATS



Information for professionals,
volunteers

and stakeholders

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About bats

Bats, the only mammals capable of active flight, are a diverse group comprising over fifty species in the European region. All of these species are insectivorous, except for a single frugivorous species. Bats are recognized for their key ecological importance, particularly due to their role in natural pest control, consuming vast numbers of insects.

Some bat species are more common, some very rare; however, all of them are highly vulnerable. Habitat destruction caused by human activities, along with direct human interference, poses a significant risk to their populations. All bats also have low reproductive rates, further exacerbating their vulnerability.

All bat species in Europe are protected by international legislation and treaties (Habitats Directive, EUROBATS Agreement, Convention on Migratory Species, Bern Convention) as well as by national legislation.



Daubenton's Bat (*Myotis daubentonii*)

Sites for bats to roost play a critical role in the conservation of bat populations. Bats do not construct their own roosts and depend on various structures for shelter; both natural (caves, tree hollows, rock cracks) and human-made (buildings, cellars, mines, engineering structures). The availability of suitable roosts is essential for their welfare and maintaining healthy populations. Some bat species depend heavily on artificial structures such as houses, churches, bridges, cellars and other buildings which are highly significant for their conservation. These structures are places with a high probability of "human-bat" interactions, including direct contact through handling (of grounded or injured bats for example). In such places bats (and their welfare) are more dependent on favourable human attitudes.

Rabies

Rabies is one of the oldest known zoonoses (diseases which can be transferred from animals to humans). The disease is caused by several lyssaviruses (Lyssa was the Greek goddess of madness). Lyssaviruses are viruses that can, in principle, occur in all mammals. The best-known lyssavirus, referred to as classical rabies virus, occurs worldwide in carnivorous mammal species (dogs, cats, ferrets, foxes and others). It also occurs in some bat species found in the Americas and on some islands in the Caribbean. On other continents (including Europe), some bat species may carry distinct bat lyssaviruses (see table below).

Lyssaviruses in European bats

In European bats only specific bat lyssaviruses were detected.

European Bat Lyssavirus-1 (EBLV-1)

Found primarily in two species from the *Eptesicus* genus: the Serotine Bat (*Eptesicus serotinus*) and the Isabelline Serotine Bat (*Eptesicus isabellinus*). These species account for around 95% of all EBLV-1 cases in Europe. However, antibodies to the virus have also been found in a number of other species around Europe, including Greater Mouse-eared Bat (*Myotis myotis*), long-eared bats (*Plecotus spp*), Natterer's Bat (*Myotis nattereri*), Common Pipistrelle (*Pipistrellus pipistrellus*), Nathusius's Pipistrelle (*Pipistrellus nathusii*), Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), European Free-tailed Bat (*Tadarida teniotis*), and Greater Horseshoe Bat (*Rhinolophus ferrumequinum*). However, none of the non-serotine species is thought to be a reservoir host or an important bridging host for the virus.

European Bat Lyssavirus-2 (EBLV-2)

Found in Daubenton's Bat (*Myotis daubentonii*) and in Pond Bat (*Myotis dasycneme*). Few tens of cases are known in Europe.

Bokeloh Bat Lyssavirus (BBLV)

Found, so far, in four cases in Natterer's Bat (*Myotis nattereri*) in Germany, France and Poland.

West Caucasian Bat Virus (WCBV)

Found, so far, in a specimen of Schreiber's Bent-winged Bat (*Miniopterus schreibersii*) in the Caucasus. Antibodies to the virus have also been found in Schreiber's Bent-winged Bat (*M. schreibersii*) in Italy.

Lleida Bat Lyssavirus (LLEBV)

Found, so far, in three cases in Schreiber's Bent-winged Bat (*M. schreibersii*) in Spain and France.

Kotalahti Bat Lyssavirus (KBLV)

A single case has been recorded in Brandt's Bat (*Myotis brandtii*) in Finland.

Divača Bat Lyssavirus

Known by a single case in Long-fingered Bat (*Myotis capaccinii*) in Slovenia.

* EBLV-1 and -2, BBLV, KBLV are of the Phylogroup 1; WCBV and LLEBV are of the Phylogroup 3. Divača Bat Lyssavirus is waiting for the final description and classification.

EBLV-1 appears to be the most widely distributed lyssavirus in European bats. It is regularly found in the Serotine Bat. Other bat lyssaviruses are recorded quite rarely. In some countries, the proportion of positive bat lyssavirus cases among tested bats may be relatively high. For example, in the Netherlands, research has shown that EBLV-1 occurs in an average of 22% of Serotine Bats found sick, weakened, dead, or caught by cats. In other countries, the percentage of positive cases is much lower, or no cases are known.

Contrary to the classic rabies virus, which, according to the World Health Organisation (WHO), causes the deaths of over 50 thousand people annually (mostly as a result of dog bites), cases of bat lyssavirus diseases in species other than bats are known to be quite rare. Throughout all rabies investigations in Europe, so far, bat rabies was found in six fatal human cases, in four domestic cats; in one Stone Marten (*Martes foina*) and in some sheep. Identified bat lyssaviruses in human cases were EBLV-1 and -2.

We must consider the risk that a bat of any species has the potential to carry a lyssavirus and take appropriate precautions.

How to tell if a bat has rabies

Rabies can only be detected with certainty in a laboratory in dead bats (and also in saliva of alive bats). When a bat is found in an unusual place, for example on the ground, and it can no longer fly well, then the animal may be sick. Usually there is no incidence of rabies, but it cannot be excluded. All necessary health and safety precautions must be taken when handling bats.

So far, there are not yet described records of rabid bats having attacked people or pets in Europe. Bats affected by rabies will probably bite if you pick them up, but healthy animals do this too. Therefore, it is important to be careful and not to touch or pick up bats without adequately protected hands.



Daubenton's Bat (*Myotis daubentonii*)

Bat rabies and the risk to humans

One can only become infected with EBLV (or other bat lyssavirus) by direct contact with infected bats (or other infected animal). For that there has to be a bite, nibble, scratch or contact with saliva from an infected bat to an open wound or mucosa of eyes, nose or mouth. The bite does not have to draw blood to be considered a risk for infection.

When handling bats, one should use gloves thick enough to protect the skin from a potential bat bite, but supple enough to enable capable handling of the bat. You should keep the bat well away from your face or use glasses and a face mask to avoid getting bat saliva (e.g. when a bat sneezes) in your eyes, nose or mouth, or possibly passing on Covid (or other viruses) from you to the bat.

One cannot get rabies from being in the same building with a bat. Bats in cavity walls or attics do not pose a danger to humans and

pets. When EBLV is found in a colony of Serotine Bats, it usually affects one or a few animals. Often it turns out that within such a colony no rabies occurs for years afterwards. A single animal with rabies is therefore no reason to remove or exclude a colony.

Detecting antibodies to lyssaviruses during serological analyses of bats with no viruses present in their saliva may provide evidence that bats have an immune response sufficient to be resistant against rabies. Studies using marking techniques have shown that seropositive (with antibodies to lyssaviruses) bats can live for many years without any signs of disease and without excreting lyssaviruses in their saliva.

All European bat species are protected in accordance with international treaties and national legislation. That means, bats may not be intentionally caught, killed, or disturbed. It is also against the law to deliberately damage or destroy their roosts.

According to the resolution of the conference "Rabies in Europe" '2005 (p. 6.4):

"Epidemiological data available so far show that the destruction of an infected bat colony is ineffective and must be avoided. This strategy will disturb the balance of the metacolony and should be avoided as far as possible not to induce an unpredictable dispersion of infected animals. It is preferable to monitor the known positive colonies (salivary excretion and serological survey with marking of sampled bats belonging to the colony) and collection of all sick or dead bats."

Rabies in bats should not be the subject of speculation. In 1986, the WHO stated that ***"Scientists as well as medical authorities are being asked rather to initiate awareness on the problem than create hysteria in the press and amongst the general public, especially with those people that have bats living in their houses. Otherwise, efforts to conserve these animals would be much more difficult."***

Who belongs to a risk group in connection with bat rabies

Anyone who works professionally or as a volunteer and has direct contact with bats has a certain risk. These could include, for example, bat researchers and those who rehabilitate animals brought into care from the wild.

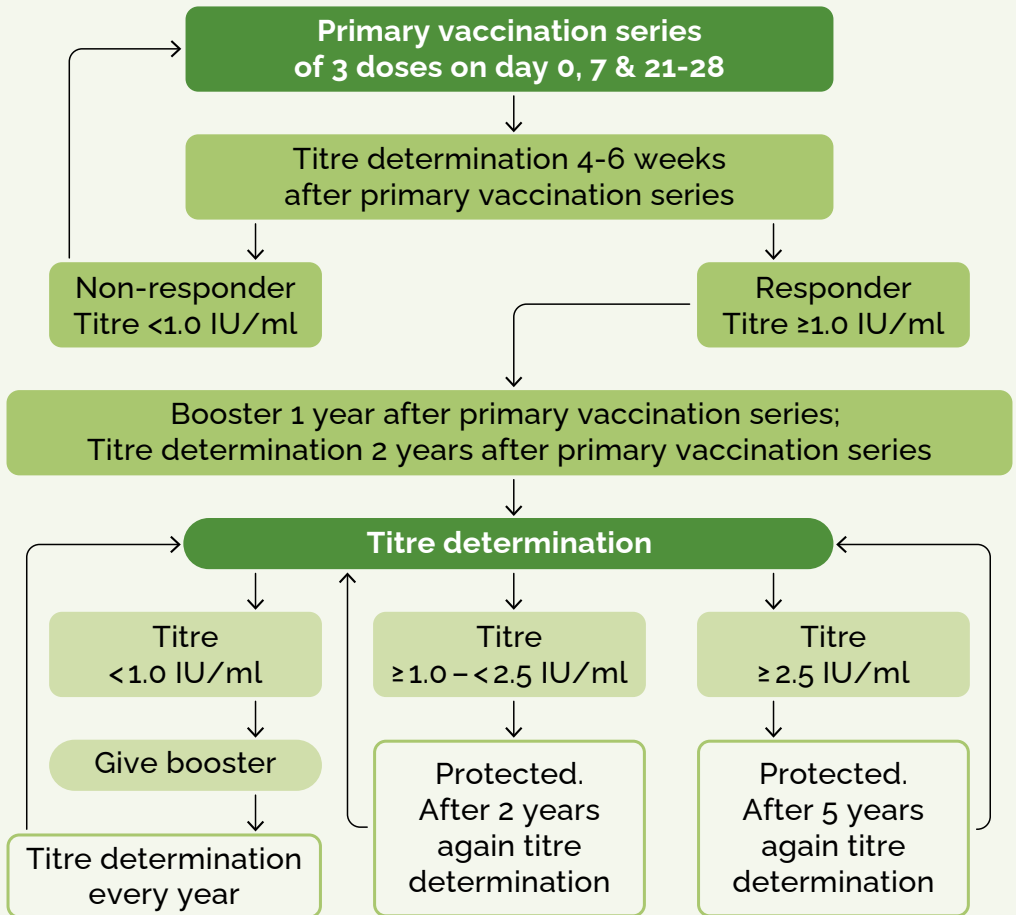
Is it important to be vaccinated against rabies when having direct contact with bats? According to the WHO guide for rabies prophylaxis in humans, "pre-exposure rabies prophylaxis (PrEP) is recommended for anyone who is at continual, frequent or increased risk for exposure to the rabies virus". In Europe, there are only a few fatal cases of EBLV known in humans. However, professionals or volunteers who may come into direct contact with bats, have a responsibility to themselves and others to get vaccinated against rabies, especially if they are regularly handling bats.

It has been shown that the currently available vaccines are effective against bat lyssaviruses of Phylogroup I (including EBLV-1 and -2), which amount to the largest number of cases. Thus, for those who may be regularly exposed to lyssaviruses, vaccination is highly recommended (and in some countries is obligatory).

Rules of PrEP are country-dependent, however, according to the WHO guidance, the general scheme should be:

- 1** getting PrEP (typically of three doses, on days 0, 7, 21 or 28);
- 2** checking antibodies titre on a regular basis (every 6 or 24 months, depending on the level of the potential exposure to rabies);
- 3** a booster dose when the titre falls below 0.5 IU/ml.

Below, there is a flow chart, adopted in the Netherlands, for people who handle bats and, thus, may be exposed to bat lyssaviruses (in particular EBLV-1 and -2, known to occur in bats there).



- It is recommended that in the period before the result of the titre determination (4-6 weeks) not to carry out activities with the likelihood of undetected exposure to EBLV.
- Non-responder in the schedule refers to anyone with a titre $< 1.0\text{ IU/ml}$, as opposed to the normally used minimum titre value of 0.5 IU/ml .
- In persons who have a sufficient titre value according to the schedule and are healthy, no booster is needed after they may have come into contact with an EBLV-infected bat, but that choice can be made.



Serotine Bat (*Eptesicus serotinus*)

What to do if you are bitten or scratched by a bat and are not vaccinated against rabies

The wound should be immediately washed thoroughly with soap and water or water alone, for at least 10 minutes. After that, the wound should be disinfected (with iodine tincture or 70% alcohol). If this is not available, regular household spirits or another disinfectant may be used. After that, a person bitten should immediately contact a general practitioner or the local public health service about getting post-exposure (PEP) vaccination.

What to do if a pet (cat/dog) has been in contact with a bat

An owner should contact a veterinarian immediately to have the pet vaccinated against rabies if it is not already vaccinated. For vaccinated pets, a booster may be recommended. The approach to contact between pets and bats may be country-dependent. A perceived contact between a pet and a bat is not an argument for euthanizing a pet. If a bat was injured / cannot fly / cannot be released, it should be transported to a bat rehabilitation centre. If the bat has died, it can be sent to a corresponding authority / laboratory (if available) for rabies testing.

What to do if you find a dead bat

In 2006, during the Meeting of Parties of the EUROBATs Agreement, Resolution 5.2 was adopted, emphasising the high importance of bat rabies surveillance, whether passive or active. Many countries have established schemes and centres for bat rabies surveillance.

If a dead bat is found, the finder can contact a nearby bat rehabilitation centre, many of which also collect deceased bats and send them to rabies research laboratories; or send a bat to a laboratory directly.

It is crucial not to touch a bat with bare hands. The dead animal is recommended to be packed into two plastic bags for storing or shipping. All details about the circumstances in which the bat was found or brought into care and, if known, how it died and any other pertinent information (for example whether there was contact with humans or pets) should be noted and placed between the two bags. If a dead animal cannot be sent immediately after being found or its death in care, it should be stored in a freezer (at -18 to -20°C). When sending by post, the bat should be placed in a sturdy box and not in a (blister) envelope.

All relevant details about the discovery (date, location, circumstances, etc.) should be carefully noted and provided to a research centre or laboratory (see Resolution 5.2 for the standard form for submission of bats for rabies testing). Quick and accurate reporting is essential to facilitate proper analysis and monitoring of potential rabies cases in bats, contributing to public health and the conservation of these important creatures.



Pond Bat
(*Myotis dasycneme*)



Front page photo: Serotine Bat (*Eptesicus serotinus*)

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