

SPECIAL
FEATURE

BAT BLOOD DONORS

Feeding and sharing in vampire bat colonies

BATS

NO SPECIES HAVE CONTRIBUTED MORE TO THE misunderstanding and fear of bats than the vampires. Three species of vampire bats occur in Central and South America, where, as their name implies, they feed exclusively on blood. Hairy-legged (*Diphylla ecaudata*) and White-winged vampire bats (*Diaemus youngi*) favor bird blood, and are adept at climbing tree branches to feed on roosting chicks. Common vampires (*Desmodus rotundus*) prefer mammal blood, and are usually found where cattle, horses, and other livestock are common. If livestock are absent, they feed instead on tapirs, deer, peccaries, agoutis, and sea lions.

People have some reason to fear vampire bats. Attacks on humans do sometimes occur, often following the removal of livestock from an area. Vampire bites are not painful, but they can be dangerous, for they are known to transmit paralytic rabies. Because the bats themselves are also susceptible to the virus, their populations undergo periodic crashes in response to rabies epidemics. The remarkable blood-sharing behavior of the bats – by which well-fed bats regurgitate blood to hungry companions – almost certainly facilitates the transmission of saliva-borne viruses, including the one responsible for rabies.

Vampire blood-sharing is a rare example among animals of reciprocity (the “You scratch my back, I’ll scratch yours” principle). Understanding why bats would share food even at the risk of infection requires an appreciation of the social organization and life history of these extraordinary creatures.

Common vampire bats often use caves, tunnels, or hollow trees as day roosts. While some roosts may contain more than 2,000 individuals, colonies most often contain 20–100 bats. Within a colony, groups of 10–20 females often roost together for years. Some of these females are related, because female offspring remain with their mothers after reaching sexual maturity in their second year. However, female groups also contain unrelated animals, as a consequence of adult females occasionally switching day roosts. Groups of up to ten males also occur, but they are not related and do not remain together for extended periods. Young males from 12–18 months of age disperse independently, often after fighting with an adult male in their natal group. Typically one adult male roosts with females and their young, while others hang nearby and periodically fight viciously to gain access to the females. On average, a male in a preferred spot fathers half of the pups born to females in that group, retaining control of his position for about 2 years. A roosting group of Common vampire bats typically consists, therefore, of a few unrelated adult males and of sets of females

with young related through different matriline.

For their size, vampires expend more time caring for their young than any other bat. Females give birth to single pups weighing nearly 20 percent of their body weight (30–35g/1–1.2oz). Although the pups are active at birth, they grow slowly and continue to receive milk from their mothers for over 6 months. Females supplement their diet with regurgitated blood shortly after birth, and also periodically during the first year. Pups begin to fly after 6 months, but do not reach adult weight until they are 1 year old.

Common vampires use smell and sound to find prey. Females from a roosting group hunt in adjacent areas, and will defend bite sites by chasing other bats away. Even when prey are abundant, successfully obtaining a blood meal can be difficult. To make a bite, a bat must first locate a warm spot where blood vessels are near the surface of the skin, using heat receptors located on its nose pad. It then uses its razor-sharp incisors to remove a small piece of skin, rather like a golf divot. Anti-coagulants in the bat’s saliva ensure that the blood flows freely as the vampire laps up the blood with its tongue. Bats’ feeding skills improve with age: those aged 1–2 fail to feed one night out of three on average, but those over 2 years old are unsuccessful only one time in ten. Failure results from the wariness of the animals under attack, which will sometimes try to brush off the feeding bats. Not surprisingly, young bats sometimes feed simultaneously or sequentially from the same wound site as their mothers, and individuals may return to the same wound site on consecutive nights.





▲ Above A Common vampire bat (*Desmodus rotundus*) reveals the razor-sharp incisors that make the puncture marks through which the bat laps its prey's blood. The truncated muzzle allows the bat to press its mouth close up against the flesh of the animal on which it is feeding.

◉ Left In Trinidad, a vampire bat takes blood from a resting donkey. To feed, the bat first of all chooses a site on an animal's skin where a blood vessel is close to the surface. It then licks the spot with its tongue before using its teeth to shear away protective hairs or feathers. Finally it removes an almost circular patch of skin to access the blood beneath.

◉ Right Bats cluster in a roost within a crevice. Although vampires sometimes gather in colonies up to 2,000 strong, these large agglomerations subdivide into smaller units, typically composed of groups of 10–20 females and their young. Blood-sharing is normally limited to these close-knit groupings.



If a bat fails to obtain a meal, it will return to the roost and beg blood from a roost mate by licking its lips. The likelihood that a bat will regurgitate and share blood depends on its association and kinship with the hungry bat. Bats do not share blood unless they have roosted together for more than 60 percent of the time. Some, but not all, blood-sharing events involve related bats.

Failing to feed is risky, as bats that go hungry starve to death within 3 days. Because starving bats lose weight more slowly than recently-fed bats, the transfer of blood buys the recipient more survival time than the donor loses. Reciprocal blood-sharing therefore results in a net benefit to participating bats. In the absence of reciprocity, annual mortality should exceed 80 percent, yet female vampire bats are known sometimes to survive for more than 15 years in the wild.

One problem for the donor is knowing how to ensure that the recipient is a genuine reciprocator and not a cheat who will receive blood without giving it in return. One way bats can at least assess each other's hunger levels is during episodes of mutual grooming. Bats that have successfully fed typically ingest over half their body weight in blood in a 30-minute period, which causes their stomach to bulge. This gut distention is likely to be noticed by another bat in the course of grooming, which frequently occurs just prior to blood regurgitation. Since both mutual grooming and blood sharing only occur between individuals that have reliably roosted together, partner fidelity appears to be essential for the persistence of this amazing reciprocal-exchange system.

JW