Reproduction of Rescued Vespertilionid Bats (*Nyctalus noctula*) in Captivity

Veterinary and Physiologic Aspects

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KEYWORDS

• Bat • Fertilization • Captive birth • Euthanasia • Ethics • Blood profile
• Thermoregulation • Torpor

KEY POINTS

- Wildlife veterinarians make responsible decisions on animal euthanasia based on chances of survival in the wild and quality of life in captivity.
- Consideration of adult female reproductive status is an important ethical aspect when considering euthanasia of wildlife casualties.
- Although vespertilionid bats of temperate regions mate before the winter, ovulation and fertilization are stimulated by homeothermy after emergence from hibernacula in the spring.
- Due to delayed fertilization, the authors argue that handicapped mated insectivorous female bats should be allowed to give birth in captivity.
- High standards of veterinary care are only possible for insectivorous bats when their annual life cycle and costs of reproduction are taken into consideration.

CHALLENGES IN WILDLIFE MEDICINE

Wildlife clinicians practicing zoologic medicine face a wide range of challenges related not only to species diversity but also to differences in the medical issues associated with captive and free-ranging wild animals. Veterinary practitioners must have

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extensive knowledge and wide experience in many specialties to offer a high standard of care in a medical field where most patients are nontraditional species that are treated only infrequently. Although the best available medical care can be provided to wildlife species on an individual basis, much research is still needed regarding conservation, ecosystem, and population health in many declining and extinction-threatened species.[1]

It is imperative that veterinary practitioners minimize distress and pain in wild animals. When addressing medical, welfare, and ethical issues related to wildlife casualties, practitioners tend to follow a decision tree with 3 main outcomes: release of successfully treated specimens, permanent captivity of nonreleasable animals, or euthanasia.[2] Euthanasia is considered an appropriate decision when animals have no chance of survival in the wild and/or a poor disposition for life in captivity. The most stressful ethical dilemma, however, concerns adult female bats due to their gravidity or possibility of giving birth to healthy offspring.

ANNUAL CYCLE OF INSECTIVOROUS NOCTULE BATS, INCLUDING REPRODUCTIVE PATTERN

In the Holarctic temperate zone, the annual cycle of insectivorous bats is influenced by seasonal climatic changes and invertebrate food availability. During their active period, female vespertilionid bats gather at summer maternity roosts where they give birth to and raise their young. Male bats remain solitary during this period. After the young are weaned and become independent, both male and female bats migrate to swarming sites, where mating takes place in the autumn.[3] Mating tends to be polygynous and promiscuous. Although copulation takes place before the winter hibernation, female bats store sperm in their uteri throughout the hibernation period, which usually lasts from December to April. On emergence from the hibernacula in the early posthibernation period, ovulation and fertilization are stimulated by homeothermy (ie, thermoregulation to maintain stable body temperature higher than the environmental temperature). This reproduction strategy is known as delayed fertilization and is of immense importance for veterinary management of bats. Female bats injured in the autumn are usually kept in homeothermic conditions, which may result in the onset of gravidity and subsequent birth of bat pups in midwinter, 2 months later.[2] To avoid such out-of-season births, wildlife rehabilitators need to simulate the natural annual cycle of insectivorous bats using artificial hibernacula.

AN ETHICAL ISSUE RELATED TO REPRODUCTION IN HANDICAPPED VESPERTILIONID BATS

The authors report a case of female noctule bats (*Nyctalus noctula*; family Vespertilionidae) that were nonreleasable due to traumatic injury but nevertheless kept in captivity rather than being euthanized because they were still capable of giving birth to healthy offspring. Although the species is classified as of least concern in the International Union for Conservation of Nature Red List of Threatened Species,[4] it is protected under international law by the Bonn (Agreement on the Conservation of Populations of European Bats [EUROBATS]) and Bern conventions.

Noctule bats, common in Europe, are a synanthropic species using human-modified habitats. They form dense hibernation clusters in hollow thick-walled city park trees and in crevices of buildings and bridges. Noctule bats are among the most common bat species brought for veterinary treatment due to injuries sustained during tree felling or reconstruction of buildings.[2]