# A reliable ruminate for research

*by Gregory Larsen*

SCIENTIFIC NAME
*Capra aegagrus hircus*

TAXONOMY
PHYLUM: Chordata
CLASS: Mammalia
ORDER: Artiodactyla
FAMILY: Bovidae



## General description

Goats were one of the earliest domesticated animals, thought to have been derived from the wild bezoar nearly 10,000 years ago in western Asia[1]. Today, by some estimates, there are over 300 breeds of domestic goat that have been developed for their production of milk, meat, hair and skins, and these breeds vary widely in size, weight and physical characteristics. In general, goats are curious, highly social and easy to handle and they are considered intelligent, clean and relatively hardy among ruminates[2]. These qualities, and their ready commercial availability, make goats a convenient and desirable animal model for research and training programs.

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Often existing infrastructure for other large animal models can easily be modified and repurposed for goats, though researchers must consider the inquisitive and social disposition of goats when protocols require long-term confinement[3]. Laboratory conditions might differ greatly from wild or agricultural settings, but a long history of domestication and accompanying husbandry techniques can help inform strategies to properly use and care for goats in a research environment.

## Research résumé

Recent years have seen an increase in the use of goats for biomedical purposes[1], and they are now used for research in a variety of fields including medicine, orthopedics, infectious diseases, psychology, chemotherapy and physiology[2]. Some have noted that this increase has paralleled the recent decline in the use of canine research models, and some institutions have specifically replaced dogs with goats as the common model for surgical training[2]. This might be, in part, because goats are perceived less critically than our traditional companion species by the general public; however, certain aspects of goat physiology also make it an ideal model for surgical studies and training. Goat hindlimbs feature well-developed muscle tissue with little inguinal adipose tissue, and the neck is long and also has minimal adipose tissue[3]; these qualities facilitate exposure and catheterization of major blood vessels. Many joints on the goat, including the stifle joint, are also larger and more easily accessible than those on canine models, and the makeup of cartilage and subchondral bone in goats is very similar to that of humans, compared to those of small animal, canine or sheep models[4]. Goats have a metabolic rate and a bone remodeling rate that are close to those of humans, and goats have been used for studies of bone, cartilage and ligamentous repair techniques. Because of their relatively large body size, goats can also be used to practice and test implantation of potential grafts, implants and prostheses for humans, although bone grafts are revascularized and incorporated more quickly in goats than in humans[5].

Several large mammals, including goats, are commonly used in research to model cardiovascular conditions, as their proportionally large hearts allow for complex mechanical interventions and facilitate observations. Goats have been used extensively to study atrial fibrillation, in particular, and research is currently underway to develop a transgenic goat that can model not only the symptoms but also the development of atrial fibrillation in a large mammal[6].

Additionally, some goats, known familiarly as 'fainting goats,' exhibit congenital myotonia, which researchers have used to study how myotonia might function in humans. Goats are also susceptible to the caprine arthritis encephalitis virus, which can be used as a natural disease model for chronic rheumatoid arthritis in humans and as a representative model for lentiviruses, which include the human immune deficiency virus[2].


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