

## Sooty Mangabey (*Cercocebus atys*) in Biomedical Research

### Overview



Image: Sooty Mangabey. Emory National Primate Research Center.

The sooty mangabey is a unique species that is rarely used in biomedical research. They are protected by their endangered species status under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II. Under this protected status, the use of the sooty mangabey in biomedical research is highly restricted (17). Despite their limited use, their contributions to biomedical research have greatly impacted our understanding of infectious disease processes.

### Natural History

Sooty mangabeys are indigenous to West Africa (12,16). Historically, their range extended from the Casamance River in Senegal to the Sassandra/Nzo River system in Ivory Coast, but unfortunately, their numbers have declined and they may be extinct in Senegal, Guinea Bissau, and parts of Guinea (15, 6). However, it has been reported that healthy populations of sooty mangabeys still exist in Sierra Leone, Liberia, and western Ivory Coast (16). Sooty mangabeys are primarily terrestrial and occupy forests, including flooded, dry, mosaic, and mangrove (Guinean Forest Zone) as well as swamp and palm forests (12).

Sooty mangabeys are a medium-sized monkey, slate gray in color with white markings on their ventral side (6) and white upper eyelids (12). Males are larger than females, heavier, and have significantly larger canines (4). Sooty mangabeys live in multi-male, multi-female groups of 15 to 100 (18). In captive groups, this species does not have a strict matrilineal-based social structure (3, 9,10). They have a promiscuous breeding system where males and females have multiple breeding partners (18). Females have a perineal swelling which begins around the age of first menses at 30-39 months (3). They also have a post conception swelling. It is of note that alpha males can discriminate between a fertile swelling (associated with ovulation) and the non-fertile post conception swelling (approximately 49 days postconception) (7). Infanticide by adult males has been documented in captive and wild groups usually shortly after a change in alpha males or with the introduction of new, immigrant males (10, 2). As with many primate species, male dominance rank generally predicts reproductive success (8).

## Models of Disease

### *Infectious Diseases*

Sooty mangabeys are used for research on human immunodeficiency virus (HIV) infection because they carry simian immunodeficiency virus (SIV) of sooty mangabey monkey (smm), a simian form of HIV (1) without developing clinical disease. Simian immunodeficiency virus of sooty mangabeys is recognized as the progenitor of human immunodeficiency virus type 2 (HIV-2) and has been transmitted to humans on multiple occasions. Both vertical and horizontal transmission of SIVsmm has been documented among sooty mangabeys living in the wild (16).

Leprosy, also known as Hansen's disease (HD), is a natural infection of the sooty mangabey (13) and is caused by the bacteria *Mycobacterium leprae* that can lead to significant nerve damage. During leprosy research performed in the early 1980s, leprosy was transmitted from sooty mangabeys to rhesus monkeys. Cross-species transmission of SIVsmm also occurred from the sooty mangabey to the rhesus macaques during these experiments. SIVsmm induces an acquired immunodeficiency syndrome (AIDS)-like disease in the rhesus monkey, unlike in the natural host, the sooty mangabey. This ultimately led to the discovery that captive sooty mangabeys carry SIV, and that the rhesus monkey was a valuable model for the study of HIV and AIDS. It was also recognized that rhesus monkeys are more susceptible to leprosy when coinfecting with simian immunodeficiency virus (SIV) and interestingly, that leprosy may play a protective role against acquired immunodeficiency syndrome (AIDS) mortality. Recently, molecular methods have been developed for leprosy and may help resolve the role of zoonoses in leprosy all beginning with the early research with the sooty mangabey (11).

A project sequencing the genome of a captive sooty mangabey was completed in 2008. The project was designed as a genome-wide comparative analyses between the sooty mangabey and AIDS-susceptible species, such as humans and macaques, to identify genetic factors that influence susceptibility to immunodeficiency viruses (14).

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