Wake Forest® Innovations

Preclinical Translational Services

Nine Areas in which Nonhuman Primates Reflect Humans

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Home to the only university-based nonhuman primate center in the mid-Atlantic and first in the U.S. to offer training in laboratory animal medicine, Wake Forest Baptist Medical Center offers more than 60 years of experience developing nonhuman primate models. The physiological similarities of nonhuman primates to humans make these models useful for studying the pathogenesis of and potential treatments for a wide range of chronic conditions and diseases.

Learn more about how nonhuman primates physiologically reflect humans and are ideal models for the investigation of medical devices, surgical procedures and novel drug candidates.

1 OSTEOPOROSIS

The reproductive physiology and skeletal anatomy of nonhuman primates are very similar to those of women.

Monkey bone shows an increase in remodeling activity that results in bone loss following an ovariectomy. After menopause women experience similar bone changes, prompting research on the effects of ovariectomy on bone metabolism in monkeys. An excellent model of the early skeletal events after menopause, these nonhuman primates are being used to study the skeletal actions of drugs designed to treat postmenopausal osteoporosis.

2 OSTEOARTHRITIS

Nonhuman primates have shoulder anatomy and physiology similar to humans.

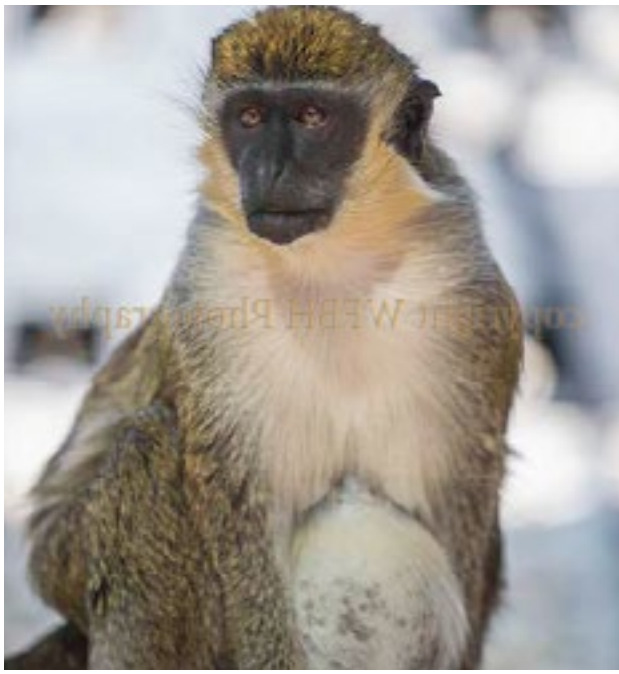
Representing a viable model for shoulder research, nonhuman primates exhibit naturally occurring bone and muscular degeneration in the shoulders, allowing for the assessment of relationships between structural and functional aspects of the shoulder and measures of physical function of the animals. Vervet monkeys naturally undergo age-related functional, radiographic and histological changes of the shoulder, qualifying them as a suitable animal model for selected translational research of shoulder osteoarthritis.

3

OBESITY AND DIABETES

Similar to those observed in humans, a number of nonhuman primate species develop diabetes and exhibit clinical and pathologic features of the disease such as obesity, insulin resistance, dyslipidemia and pancreatic pathology.

As in humans, type 2 diabetes is the most common form of diabetes in nonhuman primates and occurs more often in older, obese animals. A metabolic progression from insulin resistance and impaired glucose tolerance to overt diabetes make nonhuman primates particularly valuable animal models for studying obesity and diabetes disease pathogenesis, risk factors, comorbidities and therapeutic interventions, providing industry with multiple opportunities for highly predictive preclinical trials.



4

CHOLESTEROL AND LIPID METABOLISM

Fed a Western-type human diet, nonhuman primates experience changes in various cardiometabolic risk factors similar to those of humans.

Studies to assess the effect of diet on plasma lipid concentrations and other cardiometabolic risk factors find that African green monkeys fed a Western diet have higher plasma cholesterol levels than counterparts fed standard chow. That makes them ideal models to successfully predict the efficacy of novel drug therapies.

5

COGNITIVE IMPAIRMENT

The brain structure of nonhuman primates is similar to humans.

Initial data from a study involving the effects of whole-brain irradiation on cognition in rhesus monkeys suggest that the radiation-induced changes in cognition and brain metabolism observed in the animals may be similar to those observed in human brain tumor patients receiving brain irradiation. This makes nonhuman primates ideal for testing the effects of treatments on cognition, and offers opportunities for in-depth analysis of new drug therapies and surgical procedures.

6

DRUG ADDICTION

Like humans, nonhuman primates can self administer.

Carefully controlled experiments can be conducted with nonhuman primates without the confusion inherent in human research and with the spatial resolution of autoradiography. Repeated exposures to psycho-stimulant drugs such as cocaine show that nonhuman primates produce significant neuroadaptations throughout the brain in both structure and function. Self-administering nonhuman primates allow researchers to: examine neurobiological mechanisms underlying drug reinforcement, predict the likelihood of a test agent being abused by humans and acquire information as to how effective a pharmacotherapy may be for treating human addiction.

7

ATHEROSCLEROSIS

Female cynomolgus monkeys can develop atherosclerosis in amounts indistinguishable from males and similar to the risk of coronary heart disease in postmenopausal women.

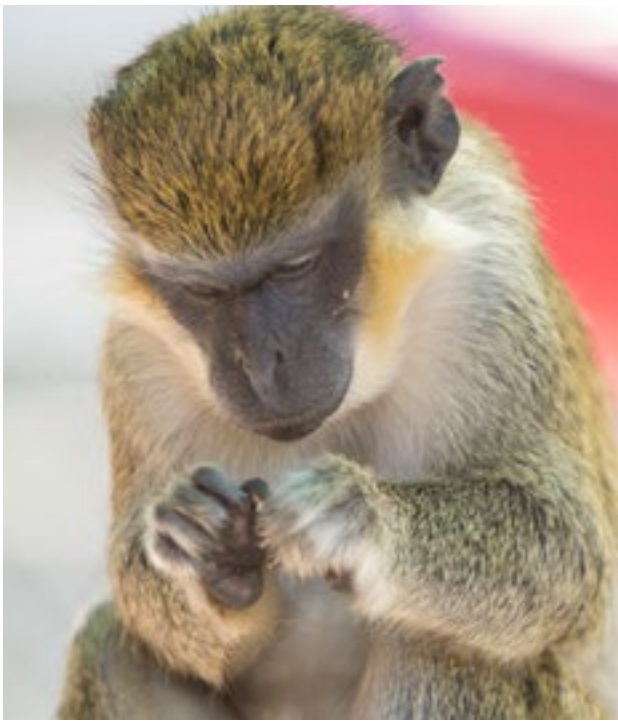
The stages of atherosclerosis in postmenopausal female cynomolgus monkeys are excellent models for understanding human cardiovascular disease and the relationships between inflammatory processes and conditions such as atherogenesis. Industry can benefit from these models by exploring the effects of diet, menopause and hormone therapies on the cardiovascular system—as well as skeletal, reproductive, endocrine and other systems.

8

BEHAVIOR

A significant percentage of genes expressed in the human prefrontal cortex are also expressed in nonhuman primates.

The executive system in humans and nonhuman primates, which is responsible for the control of behavior, is organized in a similar fashion in all primates. The prefrontal cortex brain function in nonhuman primates offers researchers the capability to investigate higher cognitive functions in this model and to translate those findings to humans.

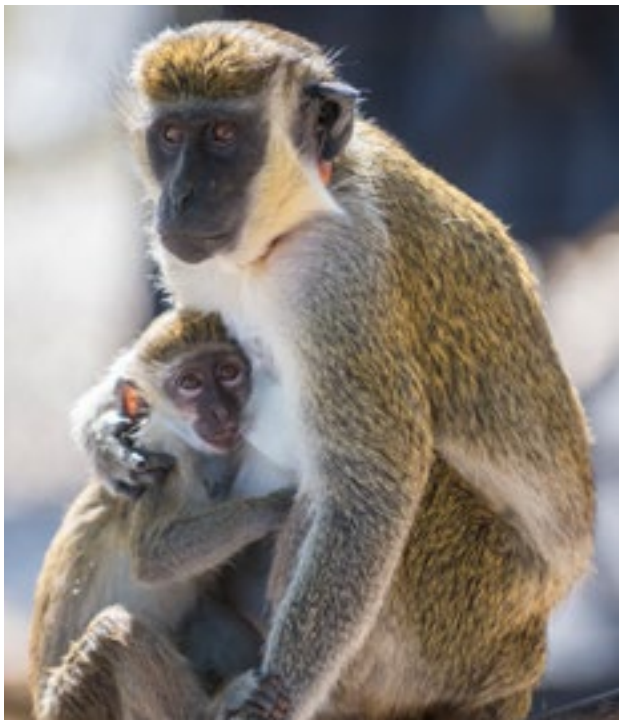


9

WOMEN'S HEALTH

Macaque female reproductive tract responses to hormonal treatment are remarkably similar to the human female.

The assessment of novel hormonal agents in female macaques provides a critical link between rodent studies and human clinical trials, with experimental findings predictive of human clinical trials as to the effects of estrogens, progestins and mixed estrogen agonist/antagonists. The reproductive tract in the macaque model provides industry with the means to explore dietary phytoestrogens as modulators of hormonal effects, and evaluate specific phytoestrogens, estrogen-phytoestrogen interactions, dose effects and the potential for use of soy phytoestrogens (SPEs) as adjuncts to conventional hormone replacement therapy in postmenopausal women.



For more information, please contact Preclinical Translational Services

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Request a Meeting

About Preclinical Translational Services

A business service of Wake Forest Innovations, Preclinical Translational Services helps to accelerate research and development programs with quality preclinical testing of medical devices, surgical procedures and therapeutics, taking advantage of a range of capabilities and the extensive experience of its internationally renowned staff members.

Protocols developed by the Preclinical Translational Services teams have been applied to a wide variety of model platforms, including pigeons, rodents, rabbits, pigs, sheep and several species of nonhuman primates. The teams assist partners as required in the crafting of any or all portions of experimental protocol, including:

- Defining objectives and study endpoints
- Choosing the preclinical animal model that best fulfills the sponsor's requirements
- Pilot study development and conduct
- Method development and codification of standard operating procedures
- Concurrent safety and efficacy testing
- Data collection
- Data analysis
- Report generation
- Quality assurance and regulatory compliance

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Reference notes

1. Perspectives on using nonhuman primates to understand the etiology and treatment of postmenopausal osteoporosis: **Read more**
2. Age-related degenerative functional, radiographic and histological changes of the shoulder in nonhuman primates: **Read more**
3. Nonhuman primates and other animal models in diabetes research: **Read more**
4. Effects of a Western-type diet on plasma lipids and other cardiometabolic risk factors in African green monkeys (Chlorocebus aethiops sabaeus): **Read more**
5. A model for assessing cognitive impairment after fractionated whole-brain irradiation in nonhuman primates: **Read more**
6. The effects of cocaine: a shifting target over the course of addiction: **Read more**
   models of neurological disease (substance abuse): self-administration in monkeys: **Read more**
7. Primate models in women's health: inflammation and atherogenesis in female cynomolgus macaques (Macaca fascicularis): **Read more**
8. Closing the loop in primate prefrontal cortex: inter-laminar processing: **Read more**
9. Assessment of hormonally active agents in the reproductive tract of female nonhuman primates: **Read more**