MORE COLLABORATIVE THAN A BARREL **OF MONKEYS**



File photo : Michaela Devitt feeds a common marmoset in the Lab in Allwine Hall.



Professor Jeff French

IN ITS FOURTH DECADE, UNO'S CALLITRICHID **RESEARCH CENTER IS STRENGTHENING** RESEARCH COLLABORATIONS AND EXPLORING NEW QUESTIONS ABOUT WHAT MARMOSETS CAN TELL US ABOUT OURSELVES

Tucked behind an unassuming door in Allwine Hall, a small team of researchers and about 20 student volunteers care for, watch and learn from a colony of more than 80 marmoset monkeys.

Since 1983, the Callitrichid Research Center (CRC) has made significant contributions to the fields of behavioral neuroendocrinology - how hormones influence social behavior - and primate conservation.

Initially, work was done with Golden Lion Tamarin monkeys (sidebar) under the direction of CRC founder Professor Jeff French. French is nearing retirement, but he's leaving the lab and the marmosets in good hands with a team building on his work while investigating new questions about how what we eat impacts how we feel and act.

"For example, if you're stressed, do you have a different microbiome structure than if you're not stressed?" asks Assistant Professor Jonathan Clayton.

Clayton joined UNO in 2018 in a role shared between UNO's biology department and the Nebraska Food for Health Center in Lincoln. Through partnerships with University of Nebraska-Lincoln and University of Nebraska Medical Center faculty, he's investigating microbiomes – the bacteria, viruses, fungi and more that live in our guts.

Because marmoset behavior and anatomy are so similar to that of humans, the UNO colony offers answers about how microbiomes impact behavior. It's a natural fit for the work the CRC has done to date, says Aaryn Mustoe, a postdoctoral research associate who has worked in the lab for a decade.

"Anything that can improve social quality of life is a topic that is of a lot of interest because it is so ingrained in a lot of health outcomes," Mustoe says. "We know diet, social company and antibiotics can influence your microbiomes, but we are just beginning to understand the consequences."

BEYOND THE STOMACH

Other studies of marmosets are yielding insights that could help humans beyond their stomach. French, for instance, has explored the tie between aging and reproduction. Like human males, marmoset males show age-related declines in testosterone. To identify changes in the body responsible for the decline, French conducted an experiment in which he treated older male marmosets by releasing hormones normally produced in the brain. Significant elevations in testosterone resulted.

"This suggests that the pituitary and the testes in aging male marmosets work just fine in testosterone production, and that the decline in testosterone is attributable to changes in brain regulation of sex hormones," French said in a 2011 UNO Magazine article. "These finding have important implications because they suggest treatments that target low testosterone in men may not have to involve the administration of synthetic steroid hormones, but that the body's natural hormone circuits might be used to increase the production of normal testosterone."

Social anxiety among marmosets also has come under review. French and thengraduate student Jon-Ryan Cavanaugh found that when marmosets experienced an increase in oxytocin, a hormone identified for its role in recognizing social cues, affection given by the marmosets' partners also increased.

"[It's] something really subtle," Cavanaugh said in the spring 2016 UNO Magazine. "They're letting their partner know to come interact with them more."

French said current research indicates all mammals similarly regulate oxytocin. Given marmosets' similarities to humans, pharmaceutical companies soon may be able to use this information to identify treatments for disorders such as autism or schizophrenia.

Such work is among the reasons the CRC has so often attracted grants from the likes of the National Institute of Health and the National Science Foundation.

Such impressive research takes a team. Mustoe and Clayton say they couldn't do the primarily observational research without Animal Care Coordinator Stephanie Womack, postdoc fellow Shiv Hayer, doctoral student Sarah Carp, and master's student Haley Hassenstab, as well as student volunteers.

The group says there is strong cohesion between the original focus of the lab and new microbiome questions. One reason: relationships can impact microbiomes and vice versa. Because marmosets are typically monogamous, they provide a translational model that might eventually lead to, say, a yogurt that reduces stress.

"You can look on Amazon and see mood probiotics," Clayton says. "This already exists, but there's not a lot of data on it."

Long term, the team hopes findings could lead to therapeutic approaches using microbiomes that treat neuropsychiatric disorders. They expect a future brain imaging partnership with UNMC and ongoing Food for Health Center collaborations will contribute toward that goal.

The team says they're energized by the relationships they're growing across the University of Nebraska system.

"One of our goals is to build this collaboration network, because we're sitting on this really valuable resource," Mustoe says. "We appreciate the people who help us out and in return, we want to help them out."

by Sam Petto



UNO's Marmosets weren't the first primates to call Allwine Hall Home. The roots of the university's Callitrichid Research Center (CRC) date to 1983 and an effort to help save the Golden Lion Tamarin monkey species.

At the time, fewer than 500 tamarins were alive, about 350 of those in captivity. That number dropped to 200 at one point but now has increased to about 2,500 in the wild. About a third of those are descendants of golden lion tamarins raised in human care. They remain an endangered species, though.

UNO initially had six pairs of the monkeys that sport a reddish-gold coat and a long, backswept mane. The 12 tamarins had been among those kept at Omaha's Henry Doorly Zoo. They were top breeders, and because of that were no longer needed for that purpose for fear that their genes would be overrepresented in the tamarin population.

UNO Professor Jeff French requested the 12 be housed at UNO for study of their fertility and eating habits.