A t NC State, we are improving the world of veterinary medicine in numerous and exciting ways. Here are four areas where we are breaking new ground.

**CONQUERING PAIN.** Like humans, animals experience chronic pain from a variety of conditions such as arthritis, back issues, and nerve damage. In veterinary medicine, however, chronic pain is not well understood and often underdiagnosed. The first step to a breakthrough is establishing methods to measure pain. The work of B. Duncan X. Lascelles, professor of translational pain research, has helped us learn how to reliably measure chronic pain in naturally occurring chronic disease in animals and subsequently test novel therapeutics for pain relief. Recent work from our Translational Research in Pain Program significantly contributed to the first FDA-approved treatment for osteoarthritis pain in cats.

**UNDERSTANDING AGING.** Natasha Olby, professor of neurology and neurosurgery, leads the nation’s first veterinary gerontology program. Health issues related to aging frequently factor in Olby’s work. Her research examines changes in cognition, sensory function, postural stability, mobility, and frailty in elderly dogs. The team has developed novel measures of age-related changes, and its work has highlighted the similarities in the neuro-aging process between dogs and humans. More recently, the program started clinical trials to evaluate new therapies for aging. Olby and other faculty have introduced geriatric medicine into the veterinary student curriculum.

**ERADICATING CANCER.** Our equine team is using a new approach to treat melanoma, squamous cell carcinoma, sarcomas, and other malignancies in horses. With high-frequency irreversible electroporation, called H-FIRE, we place electrodes directly into tumors and then deliver electrical pulses that are specifically tuned to target cell and organelle membranes. This results in a unique form of immunogenic cell death, killing cancer cells but sparing the tissue architecture, which allows H-FIRE to be delivered directly adjacent to critical structures such as nerves and major blood vessels. H-FIRE lets us treat standing sedated rather than anesthetized horses, a huge advantage over comparable treatments. We have completed clinical trials for melanoma in equine patients and breast and liver cancer in canine patients. We are working to expand this technology to broader veterinary and human clinical use.

**ENHANCING BIOSECURITY.** In the Population Health and Pathobiology Department, a research team led by Gustavo Machado has developed an app that can monitor the spread of swine virus throughout the country. The app uses protected industry data and predictive models to rapidly determine how to contain an outbreak. The development of interpretable machine learning to model key biosecurity features is crucial to analyzing biosecurity on farms. For the first time, GIS maps are used to capture the number and size of barns, and the app combines on-farm biosecurity plans and animal movement dynamics with outbreak data of endemic diseases shared weekly by industry stakeholders. The research could lead to predictive and interpretable machine-learning models for identifying and ranking biosecurity practices for each farm and predicting larger outbreak risks.

Please visit go.ncsu.edu/vetmedinnovation to read more about these exciting developments.