

NEWS

What's Next for Veterinarians?

Patricia Wuest, Editorial Director, NAVC

Cutting-edge diagnostic tools, exciting technological developments, and promising advances in animal-health research have provided veterinarians with the ability to ensure that their patients stay healthy and live longer.

WEARABLE MEDICAL DEVICES

The use of wearable medical devices—GPS trackers, radio-frequency identification sensors, Bluetooth, cameras, antennas, transmitters, etc.—shows no sign of slowing down as both pet owners and veterinarians embrace the technology they offer. These devices are not new, but they are having a profound impact on veterinary medicine via the Internet of Things (IoT). IoT is “a system of interrelated computing devices,

mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.”² Simply put: IoT is creating a world where all devices that can be turned on and off, from toothbrushes to TVs, will be connected and sharing data. The number of connected wearable devices worldwide is expected to hit over 1.1 billion by 2022; in 2016, that number was just 526 million.³

Initially, wearable medical devices were basic GPS or single-activity trackers. “If you look at some of the early companies on the market, they were trying to solve a really basic problem—lost dogs,” says Aaron Masecar, assistant director of the Translational Medicine Institute at Colorado State University. “If a dog jumped over the fence or gets out somehow, it has a GPS collar on and you could track your dog. That was the single-use case that developed.”

From their humble beginnings as basic GPS trackers, these devices evolved to include activity tracking capabilities. Eventually, some companies began developing “smart” collars that incorporated sensors that continuously monitor dogs or cats for vital health and behavior attributes—body temperature, heart rate, respiration rate, pH levels, and activity levels.

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“They were really cool, but the technology didn’t go anywhere,” says Masseur. “But then Whistle [makers of a popular pet tracker] got acquired by Mars and Mars started distributing their trackers to a select group of their Banfield clients. They started getting tons and tons of data. The activity trackers moved away from this really basic, not well-defined tool in terms of diagnostics into the big data area. And once it jumped into the big data area, they could run their analytics on it and look at thousands of users simultaneously.”

Mars Petcare’s Pet Insight Project synched the information from the Whistle activity trackers to Banfield’s hospital data. “That’s when they started coming up with some really interesting things, like generating data about post-surgery recovery for animals,” says Masseur. “The average veterinarian thinks an animal will recover within 7 days of post-surgery. But what they were able to show is that they’re not at full activity level until around 28 days later. They realized that the amount of pain control and other things they would be doing to help the animal get back to regular health should be based on a month of recovery instead of just 7 days.”

Other applications include helping veterinarians to detect early signs of medical conditions, such as dermatological issues. “Before you get to the point where an animal is in a lot of pain or has a flare-up of a condition that causes bleeding, for example, [the veterinarian] is able to say, ‘We need you to come in right away before it gets to that point,’” says Masseur. “And that’s very exciting.”

BIOMARKER TESTS AND TOOLS

Biomarker testing is a wide-ranging field, but one diagnostic trend that’s emerging is predictive tools that are making it possible for clinicians to intervene earlier to manage disease in dogs and cats. Just as wearable medical devices have contributed to the massive amounts of data available to veterinary researchers, in-hospital data can be used to develop predictive algorithms and tests.

“You can, at an earlier stage in the life cycle of the disease or pathology, identify things that are going to happen in the future and that’s the most important benefit,” says Masseur. “In 6 months, there’s going to be ‘x’ problem, and we have the biomarkers that have given us an indication of this, so let’s start doing something about it, let’s start treating it, let’s start

engaging in preventative care so that the acute onset is not going to be as traumatic.”

Researchers at Waltham Petcare Science Institute, a UK Mars Petcare company, evaluated 20 years of data from 150,000 cats treated at Banfield Pet Hospital and looked at 35 possible parameters, such as age, sex, breed, signalment, and various lab values. They narrowed it down to 6 parameters that appeared to be the most important for identifying cats at high risk of developing chronic kidney disease (CKD)—blood urea nitrogen (BUN), creatinine, urine specific gravity (USpG), urine protein, urine pH, and white blood cell count—plus the cat’s age. The result is RenalTech, available through Antech Diagnostics, which can predict CKD in cats 2 years prior to the patient showing any symptoms of the disease. RenalTech has been shown to be more than 95% accurate.

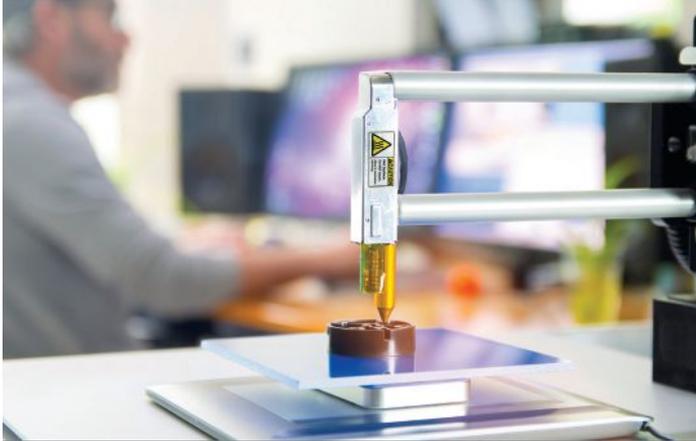
The future of biomarker predictive tools is bright, says Kay O’Donnell, vice president of Waltham. “The key is being able to connect and integrate the data. We are on the edge of something quite remarkable that will increase the quality of life for the pets that we serve.”

GENETIC TESTING

DNA tests are yet another game-changing category that has seen explosive growth recently. Along with revealing breed type, these tests reveal genetic predisposition to certain diseases, such as polycystic kidney disease and dilated cardiomyopathy in dogs and hypertrophic cardiomyopathy in cats.

Armed with the knowledge that a dog or cat may be more likely to have certain conditions or diseases, the veterinarian can create a customized health plan.

“There is much more information available for clients to learn about their pet, beyond just learning the breed makeup,” says Travis Arndt, director of the Animal Medical Center of Mid-America. “And though most



THE ULTIMATE PRINTOUT

Human medicine has been using 3D printing for years, and veterinary medicine is quickly catching up. As this technology becomes cheaper, it will be used in a variety of ways, from implants to prosthetics to tissue replacements.

early versions tested for one condition only, newer genetic tests allow for multiple genetic conditions to be tested at one time, with a single blood draw.”

A number of tests can be run by the lab, including full genetic attribute profiles that test for multiple medical conditions and traits and individual genetic tests for when there is a concern about a specific medical issue.

Armed with the knowledge that a dog or cat may be more likely to have certain conditions or diseases, the veterinarian can create a customized health plan. “Conditions such as lens luxation, degenerative myelopathy, and metabolic diseases would benefit from early diagnosis and intervention,” says Arndt. Another example is von Willebrand’s disease or factor VII deficiency. “Prior to the pet receiving anesthesia and surgery, we can be prepared to minimize bleeding with surgery or have additional blood products on hand should a transfusion be needed.” Early diagnosis is also important if a pet has the *MDR-1* gene, resulting in sensitivity to many different medications. Knowing if a pet has this disorder, one can plan to avoid specific medications from which individuals experience adverse anesthetic events, says Arndt.

“Looking at genetic predispositions is an area where we can gain actionable insights to benefit the animal,” says Massecar. “It doesn’t necessarily mean that those things will happen, but that there’s a prevalence or predisposition toward something. We can do something

about it now rather than waiting. And people seem to be willing to pay for that.”

MOLECULAR DIAGNOSTICS

The rapidly evolving, promising field of molecular diagnostics offers clinicians the ability to quickly detect pathogens and their characteristics, so that they can determine appropriate treatments and measures, such as prophylaxis, therapy, and biosafety plans to control disease outbreaks.

CADET BRAF and BRAF-PLUS, developed by Antech Diagnostics, are the first liquid biopsy tests to detect the most common form of canine bladder, urethral and prostate cancer. Antech, through Antech Molecular Innovations, a joint venture with Sentinel Biomedical, is broadening access to these tests. CADET BRAF is a DNA-based diagnostic test that detects the presence of a single mutation present in 85% of confirmed cases of canine transitional cell carcinoma (TCC), also called urothelial carcinoma (UC). CADET BRAF uses forensic-level sensitivity to analyze free-catch urine to detect 85% of cases of TCC/UC in a manner that is less expensive and invasive than current alternate methods. CADET BRAF-PLUS detects DNA copy number changes and is used for dogs with clinical signs of TCC/UC that are not associated with a *BRAF* mutation, increasing the overall sensitivity to detect a TCC/UC to over 95% for eligible samples.

3D PRINTING

Advances in three-dimensional (3D) printing to make orthotics and prosthetics, to aid in surgical reconstruction, and to make practice models offer exciting possibilities for the veterinary profession.

It’s a meticulous process: The 3D printer prints one layer, waits for it to dry, and then prints the next layer on top, until an exact replica is produced. It can take several hours to print a bone and up to 24 hours to print a skull—but once a file is created, infinite copies can be printed.⁴

“It is really incredible the different functions it can serve—everything from anatomic teaching, model and simulations, and even clinical cases preparation,” says Mike Karlin, DVM, MS, DACVS-Large Animal, DACVS-Small Animal, assistant professor and veterinary orthopedic surgeon, at the Cummings School of Veterinary Medicine, Tufts University.

Mirataz™ (mirtazapine transdermal ointment)

For topical application in cats only. Not for oral or ophthalmic use.

CAUTION: Federal law (USA) restricts this drug to use by or on the order of a licensed veterinarian.

Before using this product, please consult the product insert, a summary of which follows:

INDICATION: Mirataz™ is indicated for the management of weight loss in cats.

DOSAGE AND ADMINISTRATION: Administer topically by applying a 1.5-inch ribbon of ointment (approximately 2 mg/cat) on the inner pinna of the cat's ear once daily for 14 days. Wear disposable gloves when applying Mirataz™. Alternate the daily application of Mirataz™ between the left and right inner pinna of the ears. **See Product Insert for complete dosing and administration information.**

CONTRAINDICATIONS: Mirataz™ is contraindicated in cats with a known hypersensitivity to mirtazapine or to any of the excipients. Mirataz™ should not be given in combination, or within 14 days before or after treatment with a monoamine oxidase inhibitor (MAOI) [e.g. selegiline hydrochloride (L-deprenyl), amitraz], as there may be an increased risk of serotonin syndrome.

HUMAN WARNINGS: Not for human use. Keep out of reach of children. **Wear disposable gloves when handling or applying Mirataz™ to prevent accidental topical exposure.** After application, dispose of used gloves and wash hands with soap and water. After application, care should be taken that people or other animals in the household do not come in contact with the treated cat for 2 hours because mirtazapine can be absorbed transdermally and orally. However, negligible residues are present at the application site and the body of the cat at 2 hours after dosing. In case of accidental skin exposure, wash thoroughly with soap and warm water. In case of accidental eye exposure, flush eyes with water. If skin or eye irritation occurs seek medical attention. In case of accidental ingestion, or if skin or eye irritation occurs, seek medical attention.

PRECAUTIONS: Do not administer orally or to the eye. Use with caution in cats with hepatic disease. Mirtazapine may cause elevated serum liver enzymes (See **Animal Safety** in the product insert). Use with caution in cats with kidney disease. Kidney disease may cause reduced clearance of mirtazapine which may result in higher drug exposure. Upon discontinuation of Mirataz™, it is important to monitor the cat's food intake. Food intake may lessen after discontinuation of mirtazapine transdermal ointment. If food intake diminishes dramatically (>75%) for several days, or if the cat stops eating for more than 48 hours, reevaluate the cat. Mirataz™ has not been evaluated in cats < 2 kg or less than 6 months of age. The safe use of Mirataz™ has not been evaluated in cats that are intended for breeding, pregnant or lactating cats.

ADVERSE REACTIONS: In a randomized, double-masked, vehicle-controlled field study to assess the effectiveness and safety of mirtazapine for the management of weight loss in cats, 115 cats treated with Mirataz™ and 115 cats treated with vehicle control were evaluated for safety. The vehicle control was an ointment containing the same inert ingredients as Mirataz™ without mirtazapine. The most common adverse reactions included application site reactions, behavioral abnormalities (vocalization and hyperactivity), and vomiting. **See Product Insert for complete Adverse Reaction information.** To report suspected adverse events, for technical assistance or to obtain a copy of the SDS, contact Kindred Biosciences, Inc. at 888-608-2542. For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or online at <http://www.fda.gov/AnimalVeterinary/SafetyHealth>.

EFFECTIVENESS: The effectiveness of Mirataz™ (mirtazapine transdermal ointment) was demonstrated in a randomized, double-masked, vehicle-controlled, multi-site field study involving client-owned cats of various breeds. Enrolled cats were ≥ 1 year of age and had existing documented medical history of ≥ 5% weight loss deemed clinically significant. The most common pre-existing conditions included renal insufficiency, vomiting, and hyperthyroidism. Some cats had more than one pre-existing condition. Cats were randomized to treatment groups in a 1:1 ratio of Mirataz™ to vehicle control. A total of 230 cats were enrolled and received either Mirataz™ (115 cats) or a vehicle control (115 cats) containing the same inert ingredients without mirtazapine. The cats were 2.8-24.6 years of age and weighed 2.1-9.2 kg. The dosage was a 1.5-inch ribbon (approximately 2 mg/cat) mirtazapine or vehicle ointment administered topically to the inner pinna of the cat's ear. A total of 177 cats were determined to be eligible for the effectiveness analysis; 83 cats were in the Mirataz™ group and 94 cats were in the vehicle control group. The primary effectiveness endpoint was the mean percent change in body weight from Day 1 to the Week 2 Visit. At Week 2, the mean percent increase in body weight from Day 1 was 3.94% in the mirtazapine group and 0.41% in the vehicle control group. The difference between the two groups was significant (p<0.0001) based on a two-sample t-test assuming equal variances. A 95% confidence interval on the mean percent change in body weight for the Mirataz™ group is (2.77, 5.11), demonstrating that the mean percent change is statistically different from and greater than 0.

STORAGE: Store below 25°C (77°F). Multi-use tube. Discard within 30 days of first use.

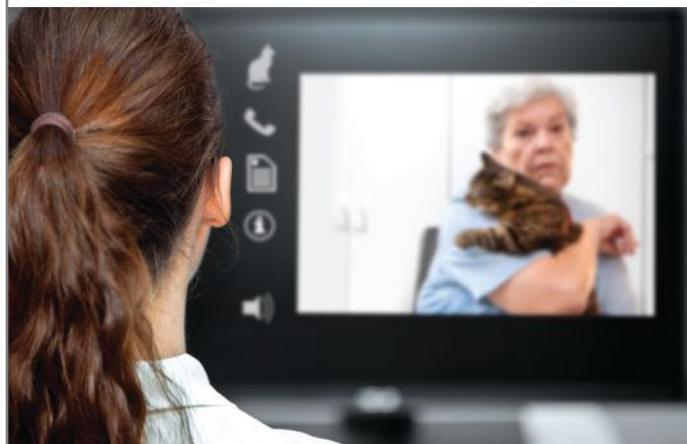
HOW SUPPLIED: Mirataz™ is supplied in a 5 gram aluminum tube.

MANUFACTURED FOR:
Kindred Biosciences, Inc.
1555 Bayshore Highway, suite 200
Burlingame, CA 94010

NADA 141-481, Approved by FDA

Made in USA.
NDC 86078-686-01
REG-MTZBS-008 Rev. 26Apr2018

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THE BOTTOM LINE

Telemedicine and telehealth tools can have an impact on the clinic's bottom line. After a telehealth consultation, "people are way more likely to go in to the clinic because someone has just told them they need to come in," says Aaron Massecar, assistant director of Colorado State University's Translational Medicine Institute. "And they spend about 25% more than the average client."

TELEMEDICINE

"In 1900, if you asked people what they wanted for transportation, they would just say 'a faster horse,'" says Massecar. "They had no idea that the automobile was right around the corner. And so people don't necessarily see the capabilities [of telemedicine]. What people are actually doing, by the thousands if not hundreds of thousands, are asking really basic questions—derm conditions, behavior, vomiting, urination. They might be able to go to PetMD for those answers, but they'd much rather interact with a human."

Telemedicine helps alleviate some of the issues that currently affect clients and their ability to get veterinary care for their pets. "The two main barriers are cost and convenience," says Massecar. "And anything that can help reduce those barriers is going to provide access for more animals." **TVP**

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