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Beyond the microscope: what's behind veterinary technology?



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Goldstein is the Senior Vice President & Chief Medical Officer Global Diagnostics at Zoetis, and a multi award-winning veterinarian specializing in small animal internal medicine with 12 years' experience as a Professor at Cornell University. The demand for veterinary care has increased rapidly in recent years, due to a combination of pet population growth and a global shortage of veterinarians. In 2022, workplace burnout was estimated to cost the industry \$2 billion¹—not particularly surprising, when considering the most common issues veterinarians face are 'lack of resources and support' (73%) and 'not enough time and energy' (72%).²

The question, then, is this—what approaches can be taken to mitigate these challenges? The most promising tool lies in the rapidly evolving field of veterinary technology, particularly artificial intelligence (Al). Through new technologies and improvements to time-tested and traditional solutions, there are greater opportunities to help predict, prevent, diagnose, and treat animal illness more quickly, accurately, and safely.

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Additionally, technology can help lighten staff workloads and improve workflows for greater efficiency and reduced stress. However, there can be a reluctance to adopt newer technologies; industry surveys have revealed that reliability and accuracy are areas of particular concern.³

To address these, it's crucial to foster understanding and support through case studies, comprehensive training, and positive personal experiences.

Smart diagnoses

A pivotal aspect of a patient workup is the application of techniques and tools to identify diseases and conditions in animals—and doing so as efficiently as possible. While existing methods we rely on are valuable, they can lack the speed and precision needed in today's fast-paced environment. External laboratory turnaround times can range from several hours to days or weeks, depending on the test and lab capacity. What's more, any error with the sample can lengthen the overall decision-making process, further delaying the time to treatment.

The rise of in-clinic diagnostics, such as point-of-care and screening tests,



represents a faster, more convenient approach.⁴ Results can be provided in minutes ⁵⁻¹⁰ and with greater detail, empowering veterinarians to identify new disease risk factors. As such, treatment decisions are reached more quickly and efficiently, leading to improved outcomes, better patient care, more valuable time with pet owners, and better workload management.

Through meaningful innovation, Zoetis is transforming the way veterinarians receive, analyze and interpret diagnostic tests with a portfolio of automated and connected technologies. Marrying diagnostics with AI, analyzers include Vetscan Imagyst®, offering 6-in-1 diagnostics on a single platform, including Al-powered Blood Smear, Fecal, Dermatology, Equine Fecal and Urine Sediment, as well as a Digital Cytology capability. The compact analyzer represents an opportunity to increase efficiency, improve workflow and elevate patient care. Studies demonstrate that Vetscan Imagyst performs at a similar level to board-certified specialist clinical pathologists and expert parasitologists.5-7,9-12

An addition to its extensive veterinary diagnostics portfolio, and sitting alongside the Vetscan® HM5, Zoetis will officially launch the world's first cartridge-based Al-powered hematology analyzer for automated complete blood count (CBC) analysis, Vetscan OptiCell™, at VMX in January 2025.

Machine learning: superficial, deep, supervised, unsupervised?

Al technology has long been harnessed by the veterinary industry. As the American Veterinary Medical Association (AVMA) outlines,¹³ Al algorithms are used to detect, delineate or classify certain features in radiographs, ultrasounds and CT and MRI images. Within the US, almost 40% of veterinarians report using Al tools to supplement their practice;¹⁴ most common applications currently include imaging, radiology, record keeping and administrative tasks. The scope of Al technology is rapidly evolving, with multiple models available to users. At its core, Al involves the creation of systems and algorithms capable of performing tasks that typically require human intelligence. In the context of veterinary diagnostics, the methods used include machine learning, deep learning, supervised learning, and unsupervised learning.

Machine learning involves identifying patterns and analyzing data. Learning from a data set, it then applies this information to a task (i.e., makes a prediction).¹⁵ Falling under this category is superficial learning, utilizing algorithms that can only evaluate data for a limited number of features. A separate subdivision of machine learning is deep learning, involving more complex architecture of artificial neurons and neural networks to make connections within provided data.¹⁶

Turning to supervised learning, where algorithms in machine learning use data that is pre-labeled during training; the algorithm then uses this training to apply it to other data sets for classification and organization. With unsupervised learning, Al finds patterns within mainly unlabeled data, requiring the technology to work more independently to discover the labels for the information.¹⁷

A trusted partner

As new devices and software are introduced to the industry, it is vital to have greater understanding of the rigorous algorithm validation process involved, so veterinarians can understand the technology and techniques available to them and their patients. A trusted, established manufacturer committed to sharing the thorough training behind their products can assuage reservations.

In the case of Vetscan Imagyst, to develop algorithms that can comprehensively and accurately identify and classify samples, Zoetis utilizes deep learning AI; in this specific example, a convolutional deep neural network is used. Each sample slide undergoes layers of precisely trained neuro inputs, for finely tuned feature identification and recognition. How was this object detection algorithm trained? Thousands of samples and elements were identified by board-certified clinical pathologists and parasitology experts. It has been said that the deep learning nature of the specific algorithm utilized in this example will allow for improved performance and functionality over time¹¹; in addition, with results provided within minutes, valuable time is freed up. Zoetis also offers add-on pathologist* review when needed.

An expanding diagnostics portfolio

When paired with AI, advanced point-of-care testing and analysis can deliver high quality, connected insights and results to clinics. The new Vetscan OptiCell features innovative AI-powered cell classification technology and a cartridge-based design for reference lab quality CBC results.¹⁸

OptiCell utilizes sophisticated Al-trained algorithms trained with normal and abnormal clinical samples, then tested and validated to reliably classify and count blood cells instantly, based on hundreds of individual cell features (i.e., cytoplasm area, color, granularity, nuclei color and shape).

Results from this hematology analyzer can be paired with Al Blood Smear (Vetscan Imagyst) for a complete hematology picture. If additional expertise is required, the veterinarian can select add-on expert review for a clinical pathologist report within hours of submission.

Care for patients and providers

Almost half of practices worldwide have reported an increase in caseloads,⁴ and with more animals requiring care, there is less available time per appointment. Time-poor veterinary teams need solutions today that can improve clinic workflows and provide individualized patient care.

The care currently offered in contemporary clinics is only possible due to previous technological innovations. More recent offerings, including smart diagnoses and Al, have proved their worth to the industry; solutions that bring together these two elements such as those available in Zoetis' diagnostic suite—are vital to the modern veterinary practitioner. Expanding on such a portfolio only allows for an even greater and more efficient way of working; the introduction of CBC analyzer Vetscan OptiCell is yet another example of the support offered to veterinarians.

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VTS-01520 *Additional cost may apply