

Advances in Veterinary Care

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Abstract

Veterinary care is advancing from predominantly reactive treatment toward preventive, precise and continuously monitored animal health management. Improvements in point-of-care diagnostics, molecular testing, digital radiography, ultrasonography, computed tomography and minimally invasive procedures are helping veterinarians obtain faster and more detailed clinical information. Telemedicine, electronic records and remote monitoring can strengthen follow-up and specialist communication, while wearable sensors and automated farm systems may identify changes in activity, temperature, feeding or rumination before obvious disease becomes apparent. Modern anaesthesia monitoring, multimodal pain control and minimally invasive surgery can improve perioperative safety and recovery. Regenerative medicine, targeted biological therapies and increasingly individualized oncology offer additional options for selected conditions, although their value depends on appropriate case selection and reliable evidence. Artificial intelligence can assist interpretation of images and large datasets, but it should support rather than replace veterinary examination and professional judgement. At the population level, stronger biosecurity, antimicrobial stewardship and One Health surveillance are essential components of contemporary veterinary practice. These advances create new opportunities, but they also introduce challenges related to cost, access, data quality, validation, privacy and the risk of over-reliance on technology. The most effective veterinary care therefore combines modern diagnostic and therapeutic tools with careful clinical assessment, animal-welfare principles, responsible medicine use and clear communication with owners and farmers. This article reviews major developments that are shaping veterinary care and outlines a practical approach for integrating them into routine animal-health decisions.

Keywords: Veterinary care, Animal health, Point-of-care diagnostics, Diagnostic imaging, Telemedicine, Precision livestock farming, Artificial intelligence, Antimicrobial stewardship

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Introduction

Veterinary care is changing rapidly as clinical practice becomes more preventive, connected and evidence based. Traditional history taking, physical examination and laboratory testing remain the foundation of diagnosis, but they are now supported by portable imaging, molecular tests, digital records, remote monitoring, advanced therapeutics and data-driven decision support. These advances are especially important because veterinary medicine must serve a wide range of species and settings, from individual

companion animals to dairy herds, poultry flocks and field-based livestock systems.

The central aim of modern veterinary care is not simply to use more technology. It is to recognise disease earlier, select tests more intelligently, provide treatment that is appropriate for the individual animal and monitor recovery in a structured way. Better communication with owners and farmers, improved infection control and greater attention to animal welfare are equally important. When new tools are combined with sound clinical

judgement, they can improve outcomes while making veterinary services more efficient and accessible.

Preventive and Proactive Animal Health Care

One of the most important advances is the shift from treatment of established disease toward prevention and early intervention. Preventive veterinary care includes vaccination, parasite control, nutritional assessment, dental care, reproductive management, biosecurity and regular health screening. In production animals, herd and flock health programmes increasingly use production records and disease trends to identify risk before major losses occur.

Proactive care also depends on recognising subtle change. A decline in feed intake, rumination, activity, growth or milk yield may precede obvious clinical signs. Regular body condition scoring, locomotion assessment and reproductive records can therefore provide valuable clinical information. In companion animals, age-specific wellness examinations and screening for renal, endocrine, cardiac or dental disorders can support earlier diagnosis in older animals. The most effective programmes are tailored to species, age, physiological stage, local disease risk and management conditions.

Point-of-Care Diagnostics and Molecular Testing

Rapid diagnostic methods have shortened the time between clinical suspicion and decision making. Point-of-care tests can provide information on blood glucose, lactate, electrolytes, ketones, infectious agents and selected biomarkers within minutes. Portable analysers are particularly useful in emergency practice, field settings and clinics where access to central laboratories is limited. They can help the veterinarian decide whether an animal requires immediate treatment, referral or additional testing.

Molecular diagnostics have also expanded substantially. Polymerase chain reaction and related nucleic-acid techniques can detect pathogens with high analytical sensitivity, while multiplex assays can test for several agents simultaneously. These methods are valuable in outbreaks, respiratory disease

complexes, enteric disease and surveillance programmes. Interpretation remains essential, because detection of an organism or its genetic material does not always prove that it is the cause of the current clinical problem. Sampling quality, timing, vaccination history and previous treatment should be considered together with the result.

Advances in Diagnostic Imaging

Diagnostic imaging has become more accessible and informative. Digital radiography produces high-quality images quickly and allows electronic storage and consultation. Ultrasonography is now widely used for abdominal, reproductive, cardiac, musculoskeletal and thoracic examinations. Portable ultrasound has particular value in farm animals and field practice because examination can be performed close to the animal without transport.

Computed tomography and magnetic resonance imaging provide detailed cross-sectional information and are increasingly available in referral veterinary centres. They can improve assessment of neurological disease, complex fractures, nasal disorders, neoplasia and soft-tissue abnormalities. Endoscopy permits direct visualisation of the respiratory, gastrointestinal and urinary tracts and can sometimes be combined with biopsy or minimally invasive treatment. These technologies are most valuable when the imaging question is clearly defined before the procedure.

Digital Health, Telemedicine and Remote Monitoring

Digital communication has created new ways to support veterinary care. Teleconsultation can assist follow-up, triage, postoperative review, behaviour assessment and communication between primary veterinarians and specialists. Photographs, videos, laboratory reports and digital images can be shared rapidly when appropriate consent and privacy safeguards are in place. Remote advice is especially useful for deciding whether an animal requires urgent examination, but it should not replace a hands-on clinical assessment when physical findings are necessary for diagnosis.

Wearable sensors and farm monitoring systems can provide repeated information on movement, temperature, rumination, feeding behaviour, location and resting patterns. A change from the animal's established baseline can prompt closer observation or clinical examination. In dairy and livestock systems, such monitoring may support estrus detection, calving prediction, lameness recognition and early identification of illness. The clinical value depends on validated devices and a clear response plan for each type of alert.

Table 1. Selected advances in veterinary care and their practical applications.

Advance	Practical application
Point-of-care diagnostics	Rapid biochemical, metabolic or infectious-disease information that supports immediate clinical decisions.
Portable ultrasonography	Field assessment of reproduction, abdominal organs, thorax and selected musculoskeletal conditions.
Digital radiography / advanced imaging	Improved image quality, storage, specialist consultation and detailed assessment of complex disease.
Molecular diagnostics	Specific detection of infectious agents and support for outbreak investigation and targeted control.
Wearable and remote sensors	Continuous observation of activity, temperature, rumination, feeding and other behavioural indicators.
Telemedicine and digital records	Follow-up, triage, specialist communication and continuity of care when used within professional limits.

Minimally Invasive Surgery and Improved Perioperative Care

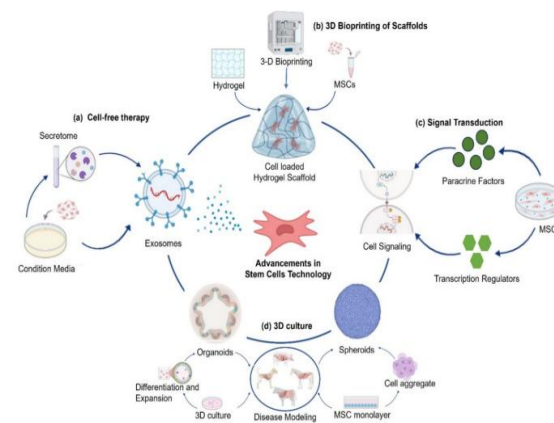
Veterinary surgery has benefited from smaller instruments, improved optics, better anaesthesia monitoring and refined pain management. Laparoscopy and thoracoscopy can allow selected procedures to be performed through small incisions, which may reduce tissue trauma and postoperative discomfort. Arthroscopy provides direct visualisation of joints and can support both diagnosis and treatment. These procedures require specialised training and equipment, so case selection remains important.

Perioperative care has advanced at the same time. Pulse oximetry, capnography, electrocardiography, invasive and non-invasive blood pressure monitoring and temperature monitoring provide continuous information during anaesthesia. Balanced anaesthetic protocols combine different drugs and techniques to achieve unconsciousness, muscle relaxation and analgesia while limiting adverse

effects. Regional nerve blocks and multimodal pain control can improve recovery and animal welfare after surgery.

Regenerative Medicine and Biological Therapies

Regenerative approaches are being explored for selected musculoskeletal and soft-tissue conditions. Platelet-rich plasma and cell-based therapies are used or investigated in horses and companion animals, particularly for tendon, ligament, joint and wound problems. These treatments aim to influence the local healing environment rather than simply suppress symptoms. Their effectiveness varies by condition, preparation method and treatment protocol, and they should not be presented as universally effective therapies.



Biological therapies also include newer monoclonal antibodies and targeted medicines for certain chronic conditions. In companion animal medicine, targeted therapies are increasingly used in dermatology, oncology and pain management. Such products can offer new options where traditional drugs are inadequate, but they require careful patient selection, monitoring and discussion of cost and expected benefit.

Veterinary Oncology and Individualized Treatment

Cancer care in animals has become more structured through improved imaging, pathology, staging and access to chemotherapy, surgery and radiation therapy. Treatment decisions are increasingly based on tumour type, grade, stage, expected response and the animal's overall health. The aim is usually to balance disease control with quality of life rather than pursue treatment at any cost.

Molecular characterization of tumours and targeted drugs are expanding the possibilities for individualized veterinary oncology. However, many advanced tests and treatments are available mainly in referral centres, and evidence may vary among tumour types. Clear communication with the owner about prognosis, adverse effects, follow-up requirements and quality-of-life goals remains central to good care.

Artificial Intelligence and Clinical Decision Support

Artificial intelligence is being evaluated for interpretation of radiographs, dermatological images, pathology slides, ultrasound images and large sets of sensor data. Algorithms may help identify patterns that require veterinary attention and can support prioritisation of cases in busy clinical environments. Digital tools can also assist with record organisation, trend analysis and reminders for preventive care.

These systems should be treated as decision-support tools rather than independent clinicians. Performance can change when an algorithm is used with different species, breeds, equipment or disease prevalence. False-positive and false-negative results remain possible. Veterinarians therefore need to understand what a system was designed to do, how it was validated and whether its output is consistent with the history, physical examination and other diagnostic findings.

Antimicrobial Stewardship and Responsible Therapeutics

Advances in veterinary care also involve better use of existing medicines. Antimicrobial stewardship encourages treatment based on clinical need, appropriate diagnostic testing and knowledge of likely pathogens. Culture and susceptibility testing can guide therapy in recurrent or severe bacterial disease, while infection prevention and improved husbandry can reduce the need for antimicrobials at population level.

Responsible therapy includes correct dosing, route, duration and follow-up. Treatment should be reviewed when the animal fails to improve as expected. In food-producing animals, withdrawal periods and residue prevention are essential. Stewardship protects

the individual animal while also supporting the wider One Health effort to slow the development and spread of antimicrobial resistance.

One Health, Biosecurity and Disease Surveillance

Veterinary medicine has an important role at the interface between animal, human and environmental health. Zoonotic disease control, food safety, antimicrobial resistance and emerging infections require cooperation among veterinarians, physicians, laboratories, farmers and public-health authorities. Better diagnostic networks and digital reporting can support faster recognition of unusual disease events.

Biosecurity remains one of the most cost-effective components of modern animal health care. Isolation of new or sick animals, cleaning and disinfection, control of visitors and equipment, vaccination planning and safe disposal of biological waste can reduce disease introduction and spread. Technology may strengthen these programmes, but consistent implementation of basic measures is still essential.

Table 2. Practical framework for integrating advanced veterinary care into routine practice.

Step	Recommended approach
Define the clinical question	Identify the decision that the examination, test or technology is expected to support.
Select an appropriate tool	Choose a validated method suitable for the species, setting and suspected condition.
Interpret with clinical context	Combine results with history, physical examination, management factors and disease prevalence.
Choose targeted intervention	Use the information to guide treatment, prevention, referral or management change.
Monitor response	Reassess clinical signs, objective measurements and welfare after intervention.
Record the outcome	Maintain clear records so later decisions can be compared with previous findings.
Review value and limitations	Consider cost, accuracy, accessibility, false alerts and whether the tool improved the final decision.

Animal Welfare and Client Communication

Technological progress has greatest value when it improves animal welfare. Pain assessment, low-stress handling, environmental enrichment and timely palliative care should remain part of every treatment plan. In chronic or terminal disease, quality-of-life assessment may be more important than the availability of another diagnostic test or treatment. Modern

care therefore combines scientific capability with humane decision making.

Communication is equally important. Owners and farmers need explanations that are understandable and realistic. The veterinarian should describe why a test is recommended, what its limitations are, what different results would mean and how treatment will be monitored. Shared decision making can improve adherence and reduce misunderstanding, particularly when several diagnostic or therapeutic options are available.

Future

The future of veterinary care will involve greater integration of clinical records, laboratory results, imaging, sensors and population-level information. Portable technology will continue to move sophisticated diagnostics closer to farms and field locations, while referral centres will expand access to advanced imaging, minimally invasive procedures and targeted therapies. Better interoperability between systems could reduce repeated data entry and make long-term health trends easier to interpret.

Future progress should be evaluated by meaningful outcomes: earlier diagnosis, better welfare, improved recovery, reduced preventable disease, more responsible medicine use and better access to veterinary services. Training will also need to evolve so that veterinarians can assess the quality of digital evidence and communicate uncertainty. Technology should extend professional judgement, not weaken the importance of clinical examination and the veterinarian-animal-client relationship.

Conclusion

Advances in veterinary care are transforming prevention, diagnosis, treatment and monitoring across animal species. Rapid diagnostics, modern imaging, remote monitoring, minimally invasive surgery, regenerative approaches, targeted therapies and decision-support systems can provide more timely and precise information. At the same time, antimicrobial stewardship, biosecurity, One Health surveillance and improved welfare practices broaden the role of the veterinarian beyond the treatment of individual disease.

The strongest veterinary care remains a combination of new technology and sound clinical fundamentals. Careful history taking, physical examination, appropriate testing, professional judgement and clear communication are still essential. When modern tools are selected for a defined purpose and their limitations are understood, they can make veterinary practice safer, more preventive and more responsive to the needs of both animals and the people responsible for them.

References

- Berckmans, D. (2017). General introduction to precision livestock farming. *Animal Frontiers*, 7(1), 6-11. <https://doi.org/10.2527/af.2017.0102>
- Neethirajan, S. (2017). Recent advances in wearable sensors for animal health management. *Sensing and Bio-Sensing Research*, 12, 15-29. <https://doi.org/10.1016/j.sbsr.2016.11.004>
- Rutten, C. J., Velthuis, A. G. J., Steeneveld, W., & Hogeveen, H. (2013). Invited review: Sensors to support health management on dairy farms. *Journal of Dairy Science*, 96, 1928-1952. <https://doi.org/10.3168/jds.2012-6107>
- Buller, H., Blokhuis, H., Jensen, P., & Keeling, L. (2018). Towards farm animal welfare and sustainability. *Animals*, 8(6), 81. <https://doi.org/10.3390/ani8060081>
- Grandin, T. (2014). Animal welfare and society concerns finding the missing link. *Meat Science*, 98(3), 461-469. <https://doi.org/10.1016/j.meatsci.2014.05.011>
- Guardabassi, L., Apley, M., Olsen, J. E., Toutain, P.-L., & Weese, S. (2018). Optimization of antimicrobial treatment to minimize resistance selection. *Microbiology Spectrum*, 6(3). <https://doi.org/10.1128/microbiolspec.ARBA-0018-2017>
- Kahn, L. H. (2020). Developing a one health approach by using a multi-dimensional matrix. *One Health*, 10, 100154. <https://doi.org/10.1016/j.onehlt.2020.100154>
- Tangorra, F. M., Buoio, E., Calcante, A., Bassi, A., & Costa, A. (2024). Internet of Things (IoT): Sensors application in dairy cattle farming. *Animals*, 14, 3071. <https://doi.org/10.3390/ani14213071>