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Recent advances in veterinary research in India

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In India veterinary research is primarily conducted by the Indian Veterinary Research Institute (IVRI), a leading institution under the Indian Council of Agricultural Research (ICAR), with its main campus in Izatnagar, Uttar Pradesh. India also has other ICAR-affiliated institutes focused on specific animals, such as the Central Institute for Research on Buffaloes and the Central Sheep and Wool Research Institute. The research covers a wide range of areas, including animal health management, disease diagnostics, vaccine development, and enhancing productivity. Beside ICAR-affiliated institutes various states based veterinary universities situated in each states are also involved in conducting veterinary and animal based research.

Key institutions and organizations

Indian Veterinary Research Institute (IVRI): A premier, oldest, and one of the largest veterinary research institutes in Asia, established in 1889, focused on research, education, and consultancy.

Indian Council of Agricultural Research (ICAR): The overarching body that oversees numerous veterinary research institutes and universities across India, including IVRI.

Other ICAR Institutes: Several specialized institutes are dedicated to specific animals, such as the Central Institute for Research on Buffaloes in Hisar and the Central Institute for Research on Goats in Mathura.

Veterinary Council of India (VCI): A statutory body that regulates veterinary practice and education in India.

Indian Association for the Advancement of Veterinary Research (IAAVR): An association that brings together professionals and students to promote veterinary research, education, and welfare.

Areas of research

Disease control and management: IVRI has developed numerous vaccines and diagnostic tools for major livestock diseases, contributing to India's self-reliance in veterinary medicine.

Animal productivity: Research focuses on improving animal production efficiency through advanced technologies and cost-effective feed formulations.

Animal health: This includes developing new surgical techniques, early pregnancy diagnosis methods, and improving overall animal health and welfare.

Technology transfer: The institutions work to transfer technologies and provide consultancy and training to farmers and the industry.

Zoonotic diseases: Research also extends to emerging zoonotic diseases that can transfer between animals and humans.

Impact and recognition

Significant achievements: IVRI has played a crucial role in achieving disease-free status for diseases like rinderpest and has developed over 60 immunobiologicals for various diseases.

Global standing: The institute has been recognized as a top revenue earner among ICAR institutions and has a global reputation for its work.

Education: IVRI is also a deemed university, offering advanced educational programs in veterinary and animal sciences. Recent advances in Indian veterinary research include the development of the country's first nanotechnology-based vaccine for Newcastle disease in chickens, the application of AI and machine learning for disease detection like Lumpy Skin Disease, and the integration of telemedicine, wearable devices, and robotic surgery. Additionally, significant progress is being made in cross-institutional collaboration between the Indian Council of Medical Research (ICMR) and the Indian Council of Agricultural Research (ICAR) to focus on areas like zoonotic diseases and food safety.

Technological and digital advancements

AI and machine learning: Used for enhanced diagnosis, such as detecting Lumpy Skin Disease in cattle with high accuracy, and for analyzing necropsy data to improve diagnostics and research speed.

Telemedicine: Facilitates remote consultations and extends veterinary care, especially in remote areas.

Wearable technology: GPS trackers and health-monitoring wearables are being used for animal safety, activity tracking, and early disease detection in pets.

Robotics and 3D printing: AI-supported surgical robots are being explored for increased precision, while 3D printing is being used for creating implants and anatomical models.

Biotechnology and vaccine development

Nanotechnology-based vaccines: A nano-based Newcastle disease virus vaccine has been developed and licensed, marking India's first nanotechnology-based vaccine.

Gene therapy and regenerative medicine: Research is focusing on innovative ways to repair and regenerate animal tissues using both cell-free and cell-based methods.

Artificial insemination and cloning: These techniques are being used for genetic management, breeding programs, and preserving endangered species.

Collaborative and preventive initiatives

Joint working groups: The ICMR and ICAR have formed joint working groups to encourage collaborative research on zoonotic diseases and food safety.

"One Health" approach: There is an increased emphasis on the "One Health" approach, which recognizes the interconnectedness of human, animal, and environmental health, with AI playing a role in its implementation for disease prevention.

Preventive medicine: Research is increasingly focused on developing novel preventive strategies, including improved parasite control and vaccination programs. Latest techniques in veterinary medicine include artificial intelligence (AI) for diagnostics, remote monitoring through wearable devices and thermal imaging, and advanced imaging like CT, MRI, and portable ultrasound. Robotic systems are also used for precision surgeries, and telehealth is expanding access to veterinary care.

Diagnostics and monitoring

Artificial Intelligence (AI): AI algorithms analyze medical records, radiographs, and other images to assist in early disease detection and diagnosis. It also helps predict disease outbreaks and can monitor animal behavior for signs of illness.

Advanced imaging CT and MRI: These provide highly detailed views of an animal's internal structures, aiding in the diagnosis of diseases, especially in complex cases.

Portable ultrasound and radiography: Advances in imaging technology have made it more accessible for use in the field and during emergencies.

Remote monitoring: Wearable devices: Smart collars and tags can track vital signs like heart rate, activity levels, and sleep patterns in real-time.

Thermal imaging: Drones equipped with thermal cameras can identify animals with elevated temperatures, which can signal illness, particularly in herd management.

Sound detection: Microphones and sound analysis can identify respiratory changes in animals.

Robotic surgery: Robotic arms assist surgeons with keyhole surgery, enhancing precision and improving surgical outcomes. 3D imaging and printing: Detailed 3D models of a patient's anatomy can be created from imaging data for surgical planning and educational purposes.

Personalized medicine: AI helps veterinarians tailor treatments to an individual animal's specific health profile, potentially improving outcomes and reducing side effects.

Robotics: Drones and other robotic systems are used for monitoring herds, automating tasks like milking and barn cleaning, and detecting sickness within a group.

Electronic identification: Electronic tags and systems are used for managing individual animal records and tracking health and performance.

Access to care and telehealth check

Videoconferencing and other platforms allow for virtual consultations, expanding access to care, especially for those in remote areas.

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