

## Genomic Breakthroughs: How DNA Testing is Shaping the Future of Veterinary Diagnostics

**Komal<sup>1</sup>, Kaushlendra Singh<sup>2</sup> and Richa Arora<sup>3</sup>**

<sup>1</sup>Assistant Professor, Dept. of Veterinary Clinical Complex (Veterinary Biochemistry), COVAS, Kishanganj

<sup>2</sup>Assistant Professor, Dept. of Veterinary Parasitology, COVAS, Kishanganj

<sup>3</sup>Assistant Professor, Dept. of Veterinary Biochemistry, COVAS, Kishanganj

**ARTICLE ID: 19**

### **Introduction:**

DNA testing is revolutionizing veterinary diagnostics, offering significant advancements in how we understand and treat animal health. The identification of diagnostic tools that are rapid, accurate and sensitive for the identification of pathogens is a foundation of treating, controlling and eliminating diseases of veterinary relevance. Novelties in science and technology have impacted positively on diagnosing health issues in animals. The genome sequence has enabled the easy, delicate, and selective diagnostic tests to be designed depending on the presence of nucleic acids. It is also possible to point to the increased efficiency of diagnostics of viral, microbial, genetic, and metabolic diseases using recent achievements in the fields of biochemistry, proteomics, engineering, and medicine. In the future, the tasks such as Polymerase Chain Reaction assays, microarray testing, genomic analysis and metabolic profiling will be performed with the help of rapid, portable, sensitive and cost-effective methods.

### **Early Detection of Genetic Diseases:**

Genomic testing helps detect the presence of genes that may increase the risks of getting diseases. Using genetic markers, veterinarians are able to identify genetic mutations associated with conditions like hip dysplasia, PRA or inherited cancer. Early detection facilitates proactive management, preventive measures and proper planning of breeding to improve an animal's quality of life.

### **Precision Medicine for Pets:**

DNA testing allows for personalized treatment plans based on an individual animal's genetic makeup. Personalized medicine is a concept that is focused on providing the right treatment to the patients and help in enhancing the diagnostic and treatment methods of

diseases. Over the last few years, the concept of personalized medicine is widely discussed in many fields of research and it will most likely be of great importance in the future. A lot of attention can be driven by the emergence of biology systems and high through put technologies. Genomics, proteomics and other omics data from each patient can be used to improve the understanding of how diseases progress, estimate patients' responses to drugs, and create customized treatment regimens. This means that especially in conditions that can be treated through surgery, chemotherapy or radiation, the incidences of the side effects and wastage of drugs can be reduced by tailored treatment plans for individual patients. The improved knowledge and interpretation of the data resulting from genetic analysis will improve the knowledge of the physiological processes in health and disease and optimize the diagnosis and treatment. Such an approach could also be useful to lessen the disease burden by focusing intervention and care more appropriately through the use of inputs coming from different sources of information. In addition, personalized medicine also seeks to reduce health care costs and reduce the occurrence of adverse events as a result of enhanced capacity to choose the right therapy at the right time for a specific patient. It is expected that as the technology progresses and the society offers support, personalized medicine will be the key to enlarging the medical horizons and improving the patient's health and the efficiency of the medical treatment.

#### **Breed Identification and Ancestry:**

DNA testing can accurately identify an animal's breed composition, which is particularly useful for mixed-breed animals. Understanding an animal's breed background helps veterinarians anticipate breed-specific health issues and tailor care accordingly. Additionally, breed information can provide insights into hereditary conditions and guide preventive measures.

#### **Enhanced Disease Surveillance and Control:**

Genomic tools help in tracking the spread of infectious diseases within animal populations. By sequencing pathogens, scientists can identify genetic variations and monitor how diseases evolve. PCR, NGS, LAMP, and ELISA are molecular technologies that can be applied in improving zoonotic disease diagnostics, and therefore improving surveillance, detection, and identification of pathogens to allow for specific control measures. This information is crucial for developing vaccines, treatments, and control strategies for outbreaks, ultimately improving public health and animal welfare.

**Improved Breeding Practices:**

For breeders DNA testing is invaluable as it helps to identify the health and genetic quality of animals to be bred. Genetic testing can play an important role in preventing the spread of hereditary diseases by testing prospective breeding individuals for deleterious genes. This is in the long-term interest of the breed and also helps to eliminate or at least minimize on the genetic diseases.

**Research and Innovation:**

The inclusion of genomic information in veterinary studies improves the development of the new therapies and diagnostics. Physicians can recognize genes related to different diseases, and create new treatments and methods for their detection. However, with expansion of genomics databases, more detailed information about the animal health and the disease processes are obtained.

**Forensic and Legal Applications:**

It is also used in criminal investigations involving animals including searching for lost pets as well as cases of abuse on animals. This evidence can be used to establish the identity of animals in cases of litigation or to establish lineage of animals in breeding.

**Nutritional Genomics:**

Emerging research in nutritional genomics explores how an animal's genetic makeup influences its nutritional needs. Personalized nutrition plans based on genetic information can optimize diet for better health, performance, and longevity.

**Conclusion:**

The use of DNA testing in veterinary science has become revolutionary as it offers solutions that improve the diagnostic, therapeutic and the well-being of animals. That is why it is possible to believe that in the future, there will be new discoveries that will help to develop the approaches to the treatment of animals and the carrying out of the necessary researches.

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