NIAB using next generation sequencing for genetic print of indigenous cattle

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The National Institute of Animal Biotechnology (NIAB) is working to decode the genetic blueprints for conservation of indigenous cattle breeds using Next Generation Sequencing (NGS) data and genotyping technology to establish molecular signatures for registered cattle breeds.

Institute Director G. Taru Sharma said the process will help in the cattle breeds purity for identification and conservation. The focus has also been on developing new generation vaccine platforms against livestock diseases crucial for animal health and reducing economic losses due to disease outbreaks, such as brucellosis in livestock and its impact on public health.

NIAB, working under the Department of Biotechnology (DBT), research and development efforts are well tuned towards the recently announced 'BioE3 (Biotechnology for Economy, Environment and Employment) policy to boost bio-manufacturing in through biotechnological interventions to position the country as a global leader, she said.

"We are keen to handhold the industry and biotech start-ups towards transforming the country's livestock-based economy not only for food/feed security but also for developing animal vaccines, diagnostics and new generation biomolecules," said Dr. Sharma, in an exclusive interaction.

A good number of 'bio-scaffolds' (for repairing tissues), both natural as well 3D printed, are being produced for cell/drug delivery, bio-banking and using animal stem cells enriched scaffolds as various therapeutic interventions. A 'bovine primary lung cell-based 3D-pulmosphere model' was developed for superior modelling of bovine tuberculosis and to establish anti-TB drug screening platform.

Scientists here are also working on generating biomarkers of susceptibility and resistance to TB in native and crossbred cattle. The DBT has outlined six thematic verticals for a circular bio-based economy to promote bio-manufacturing in sync with the newly announce Bio E3 policy including smart proteins or alternative proteins derived from animal/plant/cell/fermented-based sources recognized as a sustainable alternative, she pointed out.

In this context, NIAB has plans to use bacteriophages and their 'lytic' proteins as antibiotics alternatives to target mastitis pathogens such as staphylococci, E. coli and streptococci. Point-of-care diagnostics such as DIVA capable Brucella ELISA kit, iron oxide nanoparticles-based mastitis detection kit, biosensor for detection of progesterone and luteinizing hormone in animal milk and serum, phyto-formulations for tick/tick borne diseases were developed.

Dr. Sharma said aquatic weed is being introduced into potential livestock feed and yeast derived protein substitution with regular feed formulations as alternative feed sources for animal nutrition to boost production and to mitigate methane/carbon dioxide emissions.

A biomarker (metabolite and protein) has been developed for early assessment of nutritional stress-induced negative energy balance leading to decreased productivity and infertility in cattle population. CRISPR-Cas9 based genome editing techniques, production of biosimilars such as protein hormones using large animal models, engineered yeast and bacteria to produce complex drugs provide exciting opportunities, she explained.

NIAB now has a research program in an area of alternate nutrition using animal cells along with two other DBT institutes. Scientists have also been reaching out to community to demonstrate technologies for sustainable livestock farming through a strategic program MILAN (meeting of livestock farmers), added the Director.