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Tech Transfer Hub at Venture Center
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Technology Match Maker | Veterinary Diagnostics | Dec 2024

Title of the tech: PAASHAYA

Saving livestock, one kit at a time !

Lead Scientist: Dr. Dhanasekaran Shanmugam

Organization: CSIR-National Chemical Laboratory

TechEx.in Case Manager: Kavita Parekh (kavita.parekh@venturecenter.co.in)

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Problem definition

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193.46 Million Cattle in India

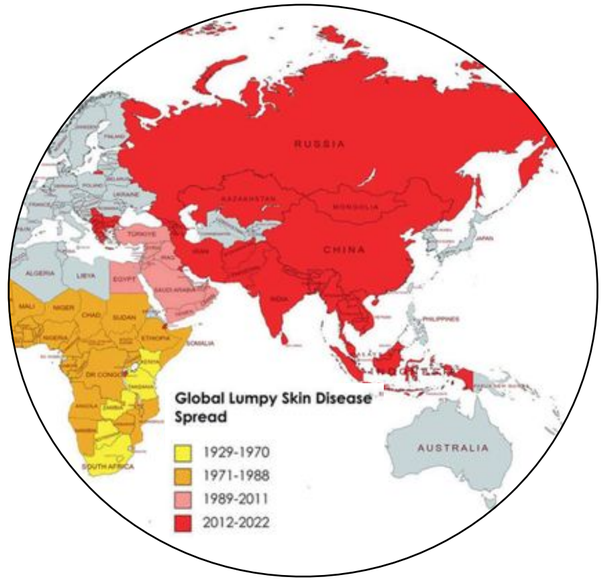
(Source: DAHD, GOI)

India ranks first in milk production @ 210 M tonnes / year

- Dairy industry is a significant contributor to the agri-economy ecosystem
- India largely comprises of unorganized dairy sector
- Infectious disease affect the animal welfare and dairy economy
- One-health focus

One of the important disease affecting dairy cattle is the **Lumpy Skin Disease Virus (LSDV)**

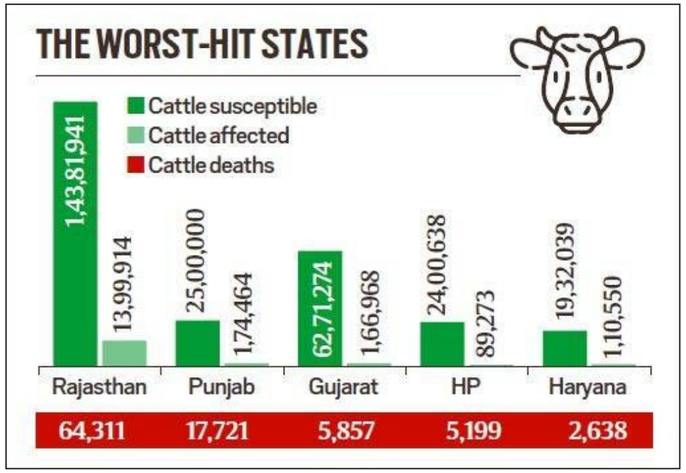
Was restricted to African continent
Present in **23 Asian countries**



- Official reporting in India in 2019
- Rapid spread and huge disease burden

Problem definition

Economic loss due to LSD nationally in >2 billion USD



- 15%-20% loss in milk production in total
- Infected animals showed 80% reduction in milk production within 2 weeks
- Recovered animals could not reach original level of milk production
- Permanent production loss up to 50% reported (1-3 L / animal)
- Reproduction affected in infected animals

2.5 M Lumpy Skin Disease cases in 2022
(Source: The Hindu)

- 1-5% death in adult animals; up to 60% mortality in heifers
- Economic loss per animal due to LSD is estimated to be ~ INR 9000/-
- Most vulnerable group are the small holding farmers

(Source: ICAR, GOI)

Problem definition

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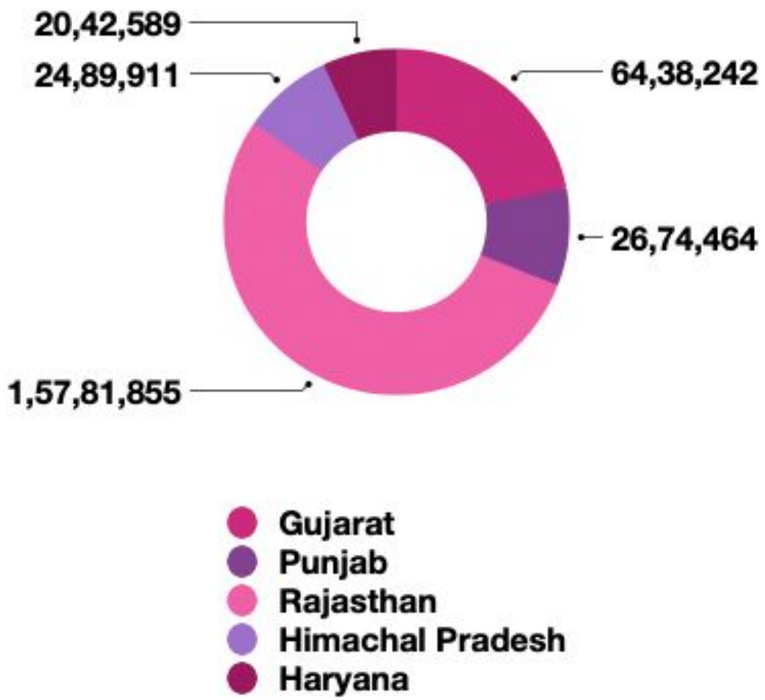
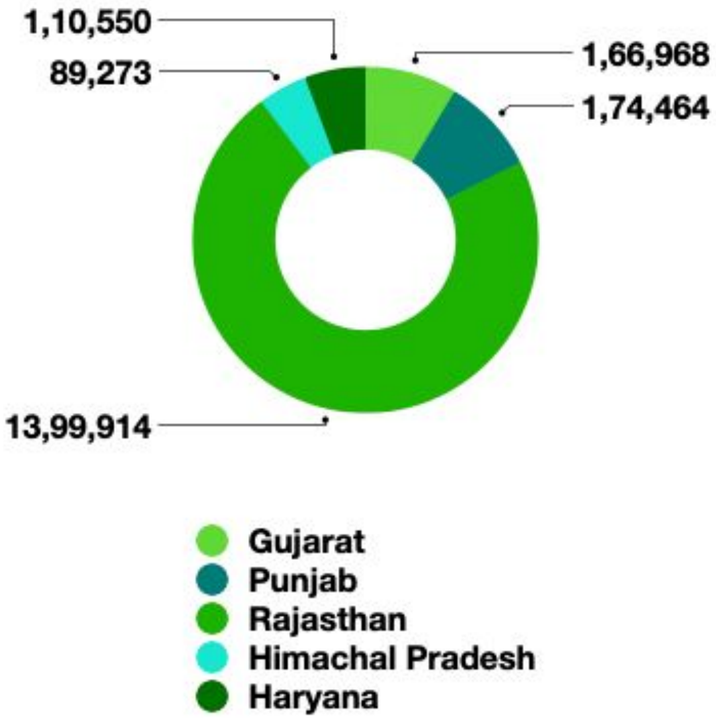
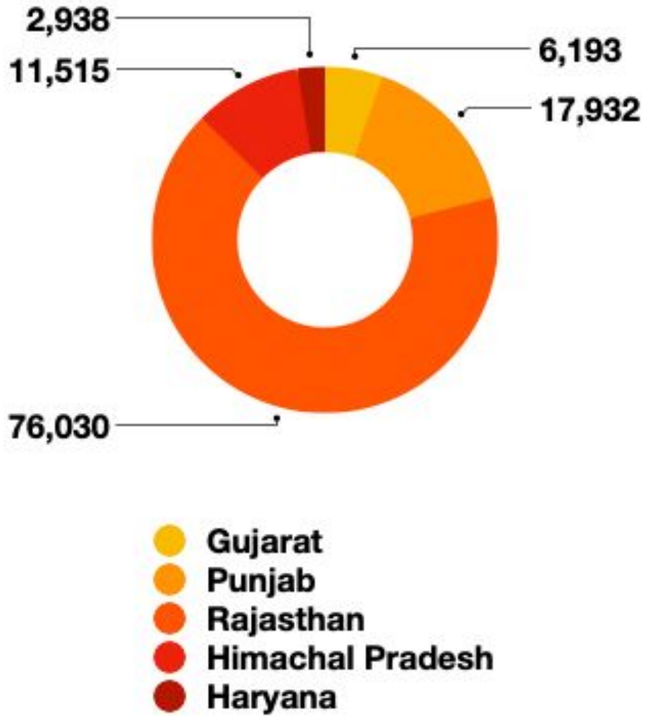
Cattle susceptible to LSD



Cattle affected by LSD



Cattle death due to LSD



Case fatality rates:

- Morbidity rates range between **5-45%**
- Case fatality ranges between **2-10%**

Need of the hour:

- No specific treatments available
- Available options include quarantine and goat-pox vaccine

Source: Department of Animal Husbandry and Dairying

Problem definition

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Tackling the disease

- Pharmaceutical treatment not disease specific
- Generalized treatment for symptoms
- Local ethano- or phyto-treatments practiced
- Vector control undertaken
  (Transmission by contact / environment possible)

Preventive vaccination is available

- Homologous vaccine used outside India
- Heterologous (goat pox) vaccine used in India

(Source: ICAR, GOI)

Action taken by herd owners

- Vaccinating animals (can reduce mortality but other issues remain)
- Symptomatic treatment / antibiotic skin care

Testing for early detection and isolation of infected animal

- Local veterinarians can recommend lab testing in registered animals
- 5%-10% of asymptomatic animals in the herd can be tested seasonally

Currently available solutions

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DAHD (GOI) recommended disease confirmation - **symptomatic testing**

Field Diagnosis:

- Skin nodules, necrosis of skin nodules, fever and emaciation

Laboratory-based Diagnosis:

- Histopathological findings
- Virus culture
- ELISA
- Fluorescent Antibody test
- PCR and RT-PCR

- All testing done by ICAR labs (poor coverage of cattle population)

- **No commercial testing in India**

Benefits	ELISA kits	Imported Real time PCR kits	Paashavya LSDV kit
Sensitivity	Moderate	High	High
Real time detection	No	++	++++
Multiplexed primers for detection	No	No	Yes
Applicability to be used for health monitoring	No	No	Yes
Asymptomatic (early) detection	No	No data	Yes
Cost	Moderate	High	Low

Value proposition

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1

Affordable

To livestock owners with small to large herd sizes

2

Scalable

Useful for cattle health monitoring and applicable for other cattle diseases

3

Sensitive

Facilitates early detection from asymptomatic cattle

4

Easy to use

No need for skilled/ experienced professional for handling

Market segment

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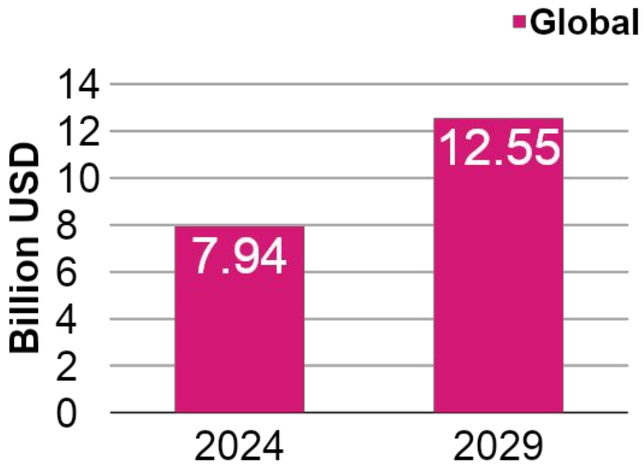
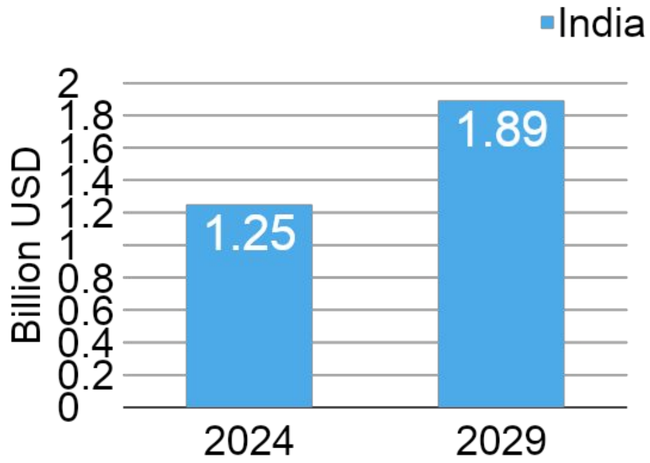
Market size of Veterinary diagnostics



10.4%

CAGR



8.63%

CAGR

Customer Segment:

- **Veterinarians:** Primary users of the diagnostics, who will recommend testing to farmers.
- **Farmers:** End beneficiaries, including individual farmers and corporate cattle farms.

Future requirement

- **Detection of multiple diseases in single sample collection**
- **Detecting pathogen variants**

Source: Mordor Intelligence

About the Technology

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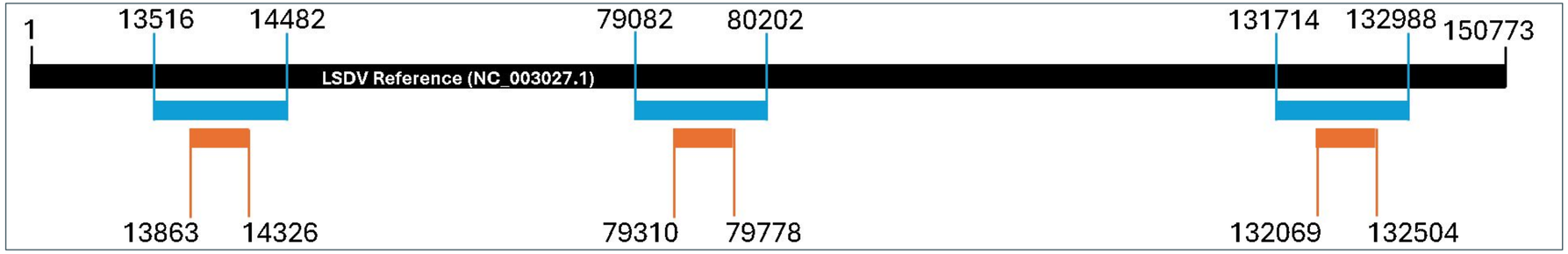
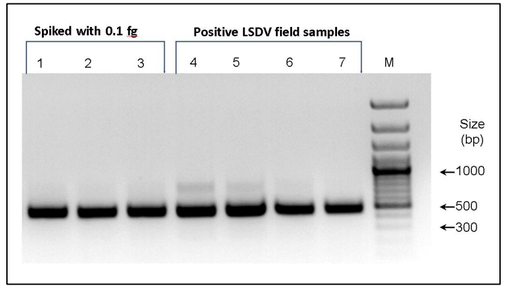
Our approach



Sensitivity



As low as 30 copies of viral DNA can be detected

Multiplex PCR

- Selection of multiple target regions
- Single tube reaction
- Detection possible with degraded or mutated DNA
- Detection of low viral loads

Readout Options

- Visualization by agarose gel electrophoresis
- Real Time PCR is under development
- Nanopore sequencing for cost efficient high throughput detection

Patent File No.: **202411074686**

On Ground Research

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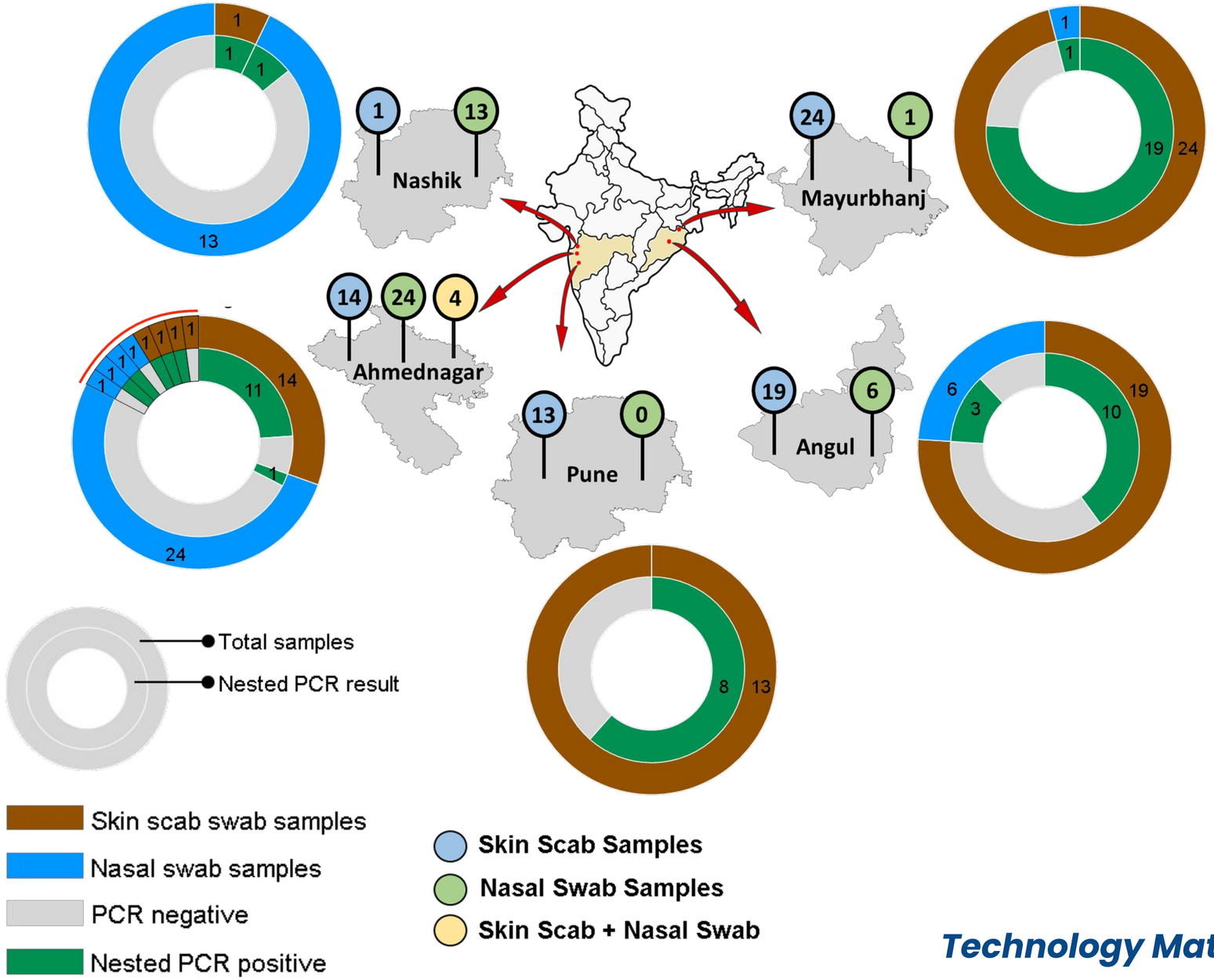

- Non-invasive (swab) sampling from animals with varied disease progression (incl. asymptomatic)
- **48 samples found positive from asymptomatic animals**
- **14.6%** of asymptomatic samples were tested positive
- Asymptomatic positive samples were confirmed for LSDV infection using Oxford Nanopore Technology
- Ability to **detect asymptomatic** LSDV infections

Current Status

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Technology Status:

- Selected and presented in the second round of **BEST-ABLE 2024** west-zonal contest
- IP Status: **Patent filed**
- Priority date: **3/10/2024**
- Coverage: **India**
- Patent File No.: **202411074686**
- Patent filing: To be completed in 2025

Publications:

- **Surveillance of Lumpy Skin Disease Virus (LSDV) and variant characterization from dairy cattle in India – Manuscript submitted to Virus Evolution-Oxford Academic journal**

Awards

- **Awarded Best Poster at the National Science Day celebration held at CSIR-NCL, Pune on 26th Feb, 2024**
- **Best poster award in the 32nd National Congress of Parasitology conference held at IISER-Pune on 3rd-5th Oct, 2024**

Team & Organisation

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Organization:
CSIR-National Chemical Laboratory, Pune

- Premier R&D laboratory in chemical and biological sciences & engineering
- Track record of working with industry and tech transfer / spinout ecosystem

Lead Scientist

Dr. Dhanasekaran Shanmugam
Senior Principal Scientist, CSIR-NCL

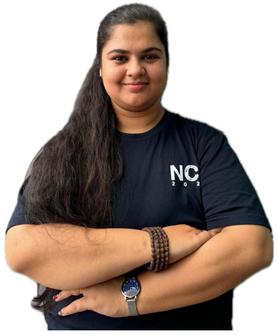
- **20+ years of experience** in molecular parasitology / infectious disease
- National & global recognition
- Track record of R&D projects funded by CSIR/DBT/SERB/DST / Mentoring Ph.D & M.Tech students / National & international collaborations

- **BMGF funding for developing low cost diagnostics for livestock diseases**
- Networking with organization working in livestock sector - BAIF, Pune / ICAR-NIVEDI

Team strengths and expertise

Sindhuri Upadrasta

Molecular Biology
Parasitology



Manali Bajpai

NGS technology
Animal Diseases
Molecular Diagnostics

Ajinkya Khilari

NGS technology
Genomics
Molecular Diagnostics

Next Steps

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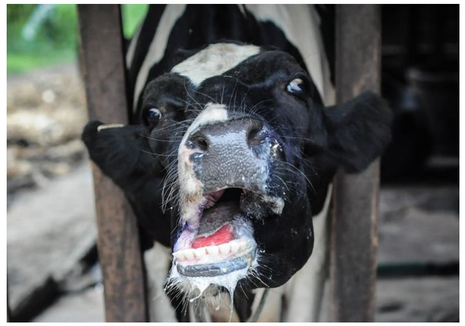
- Optimizing/improving the LSDV diagnostic kit (qPCR / Nanopore sequencing)
- Developing rapid diagnostic methods for the detection of other cattle diseases like **Foot and mouth disease, brucellosis and hemo-protozoan infections**



- Development of point of care detection (eg: **CRISPR**)
- Establishing tie-ups with commercial farms for carrying out regular inspections of their herds
- Developing a diagnostic panel encompassing all notifiable animal diseases
- Spreading awareness of the benefits of early detection of animal diseases among livestock owners

Seeking:

- Industrial partners interested in sponsoring further technology advancement and scale up.
- Industrial partners interested in raising 3rd party funds for a collaborative project.
- Industrial partners interested in technology licensing.
- Industries interested in tapping scientist capabilities as an expert/ consultant.
- Tie-ups with commercial farms or Government organizations to carry out regular checkups for cattle.popp

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