

## Paper-based strip sensor for monitoring of contaminants in milk

RAGHU VISHWESWARAIAH, Shreya Saha, Pushpalatha K, Shreya Talan,

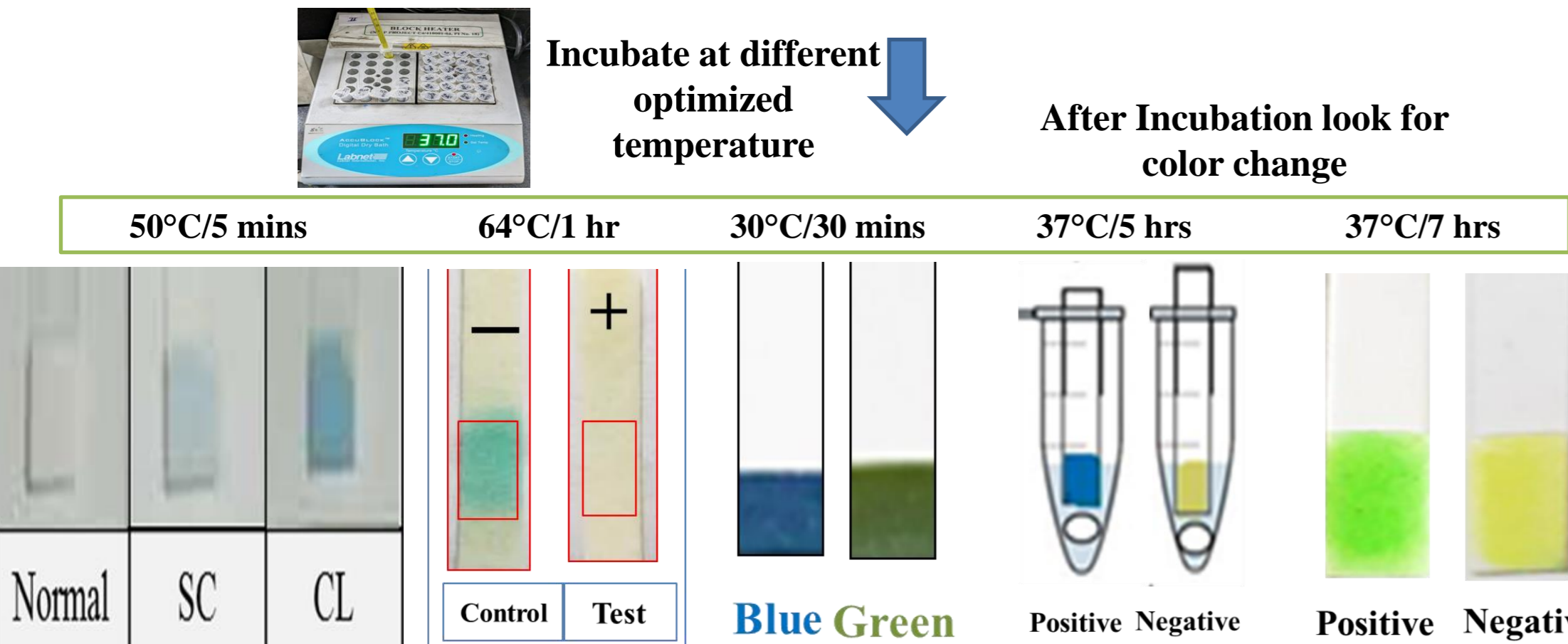
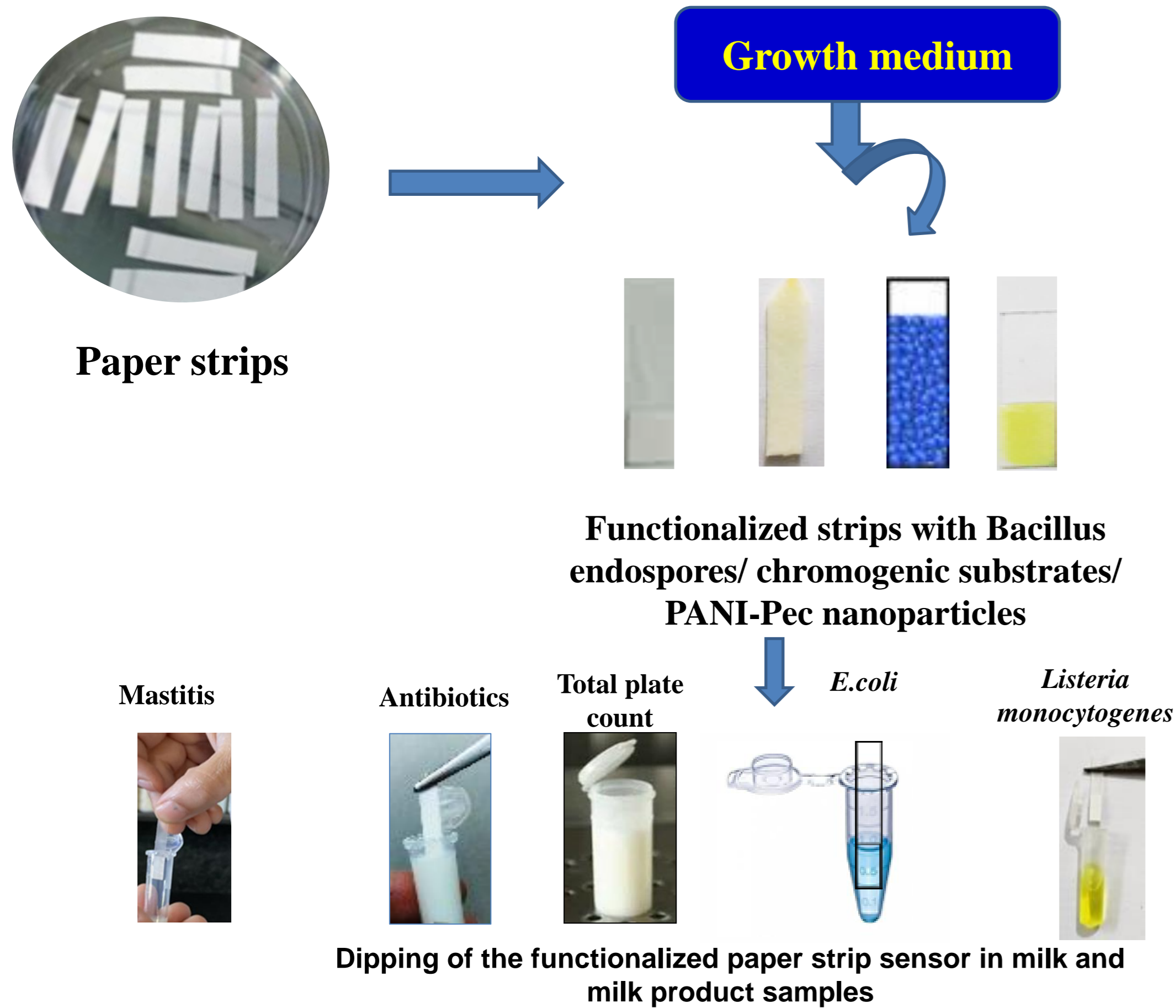
Naresh Kumar, Rashmi Hogarehalli Mallappa

ICAR-National Dairy research Institute, Karnal, Haryana-132001, India

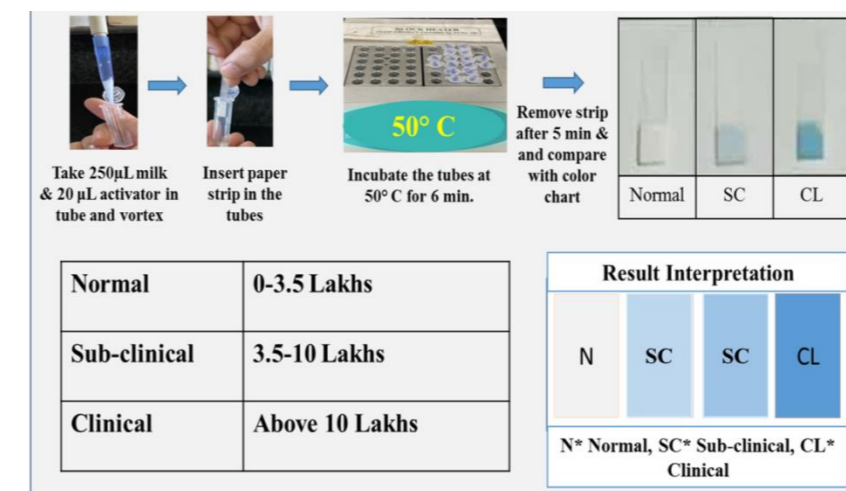
### INTRODUCTION & AIM

- Milk and dairy are vital but face contamination risks.
- Current methods like chromatography, culture-based assays, and PCR are costly and centralized.
- In contrast, low-cost paper strip sensors with spores and enzymes provide rapid, selective detection of contaminants, offering an alternative for food safety in decentralized settings.

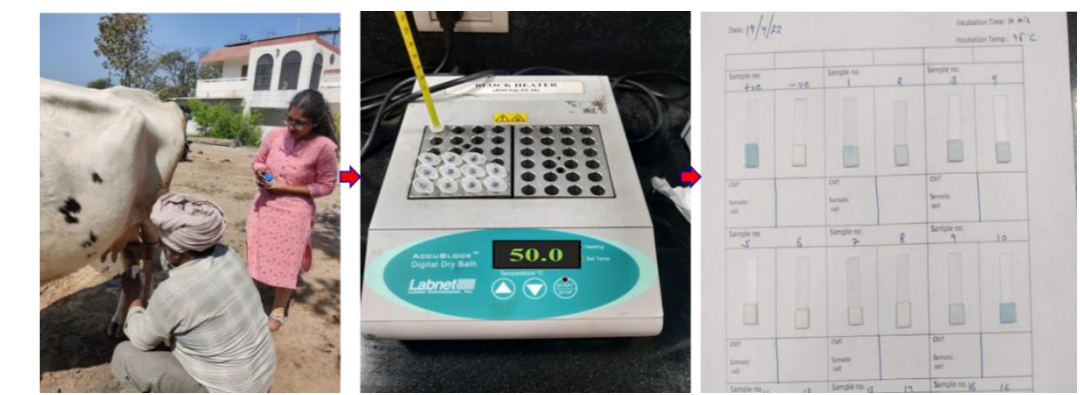
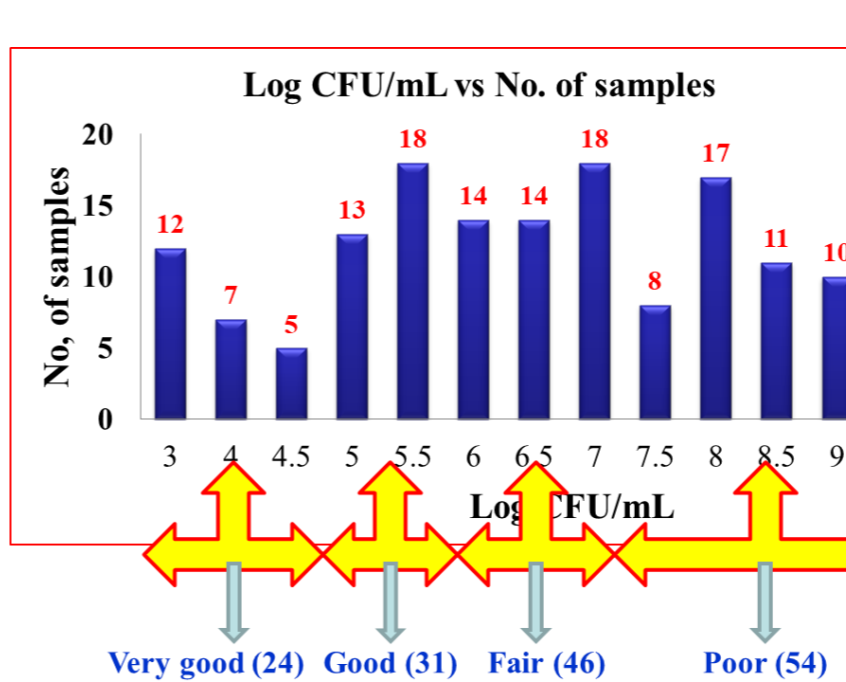
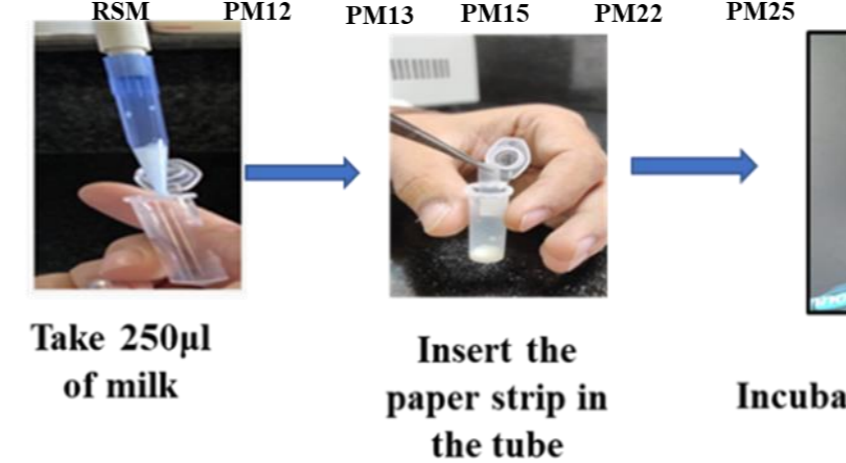
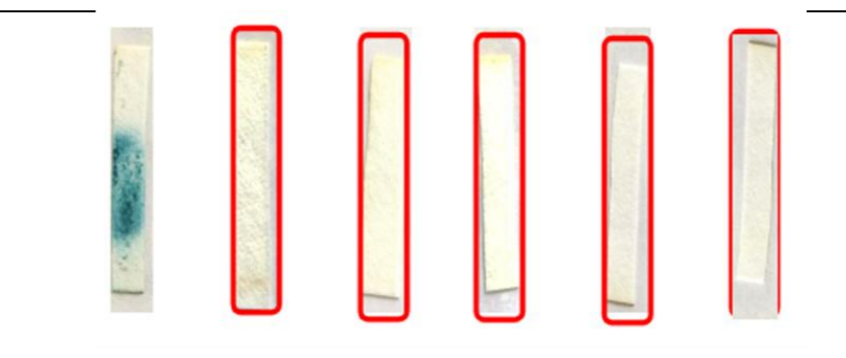
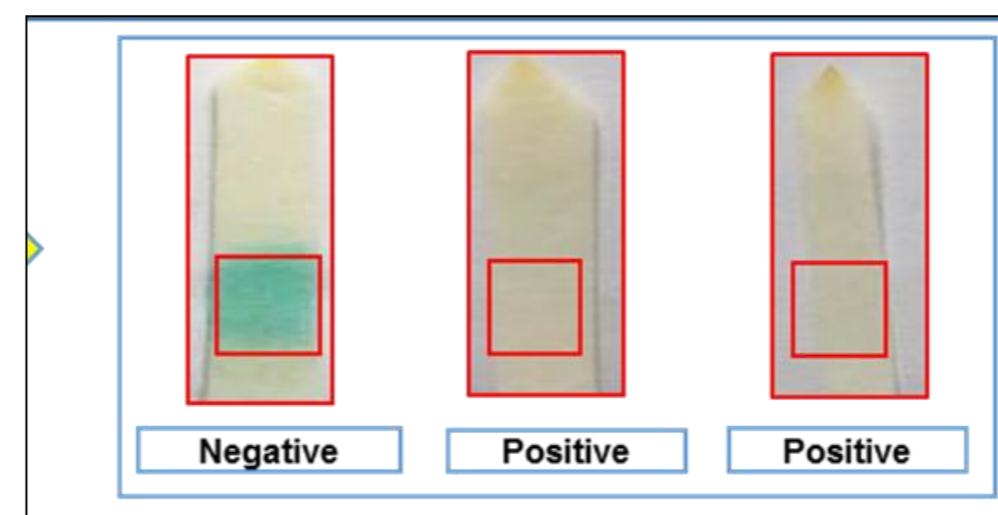
### METHOD



### RESULTS & DISCUSSION



#### Paper Strip for Detection of Sub-clinical and Clinical Mastitis

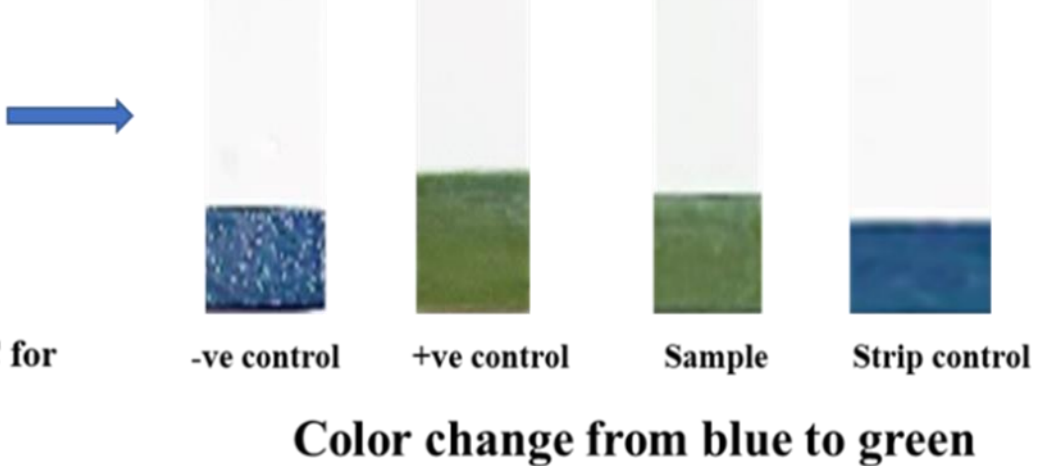


Diagnosis of clinical and sub clinical mastitis using strip		No. of animals found to be affected			
		Before		After	
		Frequency	%	Frequency	%
Sub clinical mastitis	Cow (n=120)	0	0	17	14.16
	Buffalo (n=20)	0	0	3	15
Clinical mastitis	Cow (n=120)	6	5	11	9.16
	Buffalo (n=20)	0	0	0	0



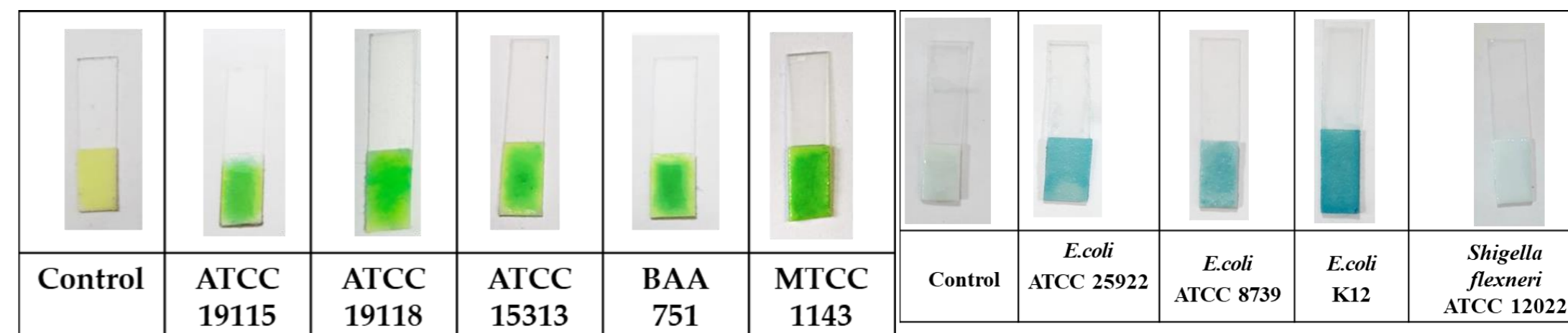
#### Validation with Charm Rosa Kits

#### Paper Strip for Detection of Antibiotic residues in milk



Grading	Aerobic Plate Count (CFU/mL)	pH	MBRT
Very good	< 10 <sup>6</sup>	6.8	5 hours and above
Good	10 <sup>6</sup> -10 <sup>7</sup>	6.6	2 hours to 5 hours
Fair	10 <sup>7</sup> -10 <sup>8</sup>	5.5-6.5	30 minutes to 2 hours
Poor	> 10 <sup>8</sup>	< 5.5	Less than 30 minutes

#### Paper Strip for grading of raw milk based on microbial load



#### Paper Strip sensor for Listeria monocytogenes and E.coli in dairy products

### CONCLUSION

- These paper strips offer rapid, sensitive methods for monitoring chemical contaminants and hygiene indicators in milk at reception docks, manufacturing units, and food testing labs.
- While effective for screening large sample sizes and providing semi-quantitative and qualitative results, these methods currently lack quantitative detection of specific antibiotic and pesticide residues.

### FUTURE WORK / REFERENCES

- Development of multi-analyte based detection of different bacterial pathogens in milk
- Indian patents No. 365074 / 2021; 367110/ 2021; 202011054432;