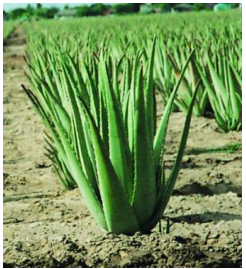
Research on Ethno-Veterinary Science and Practice for managing Mastitis among cows



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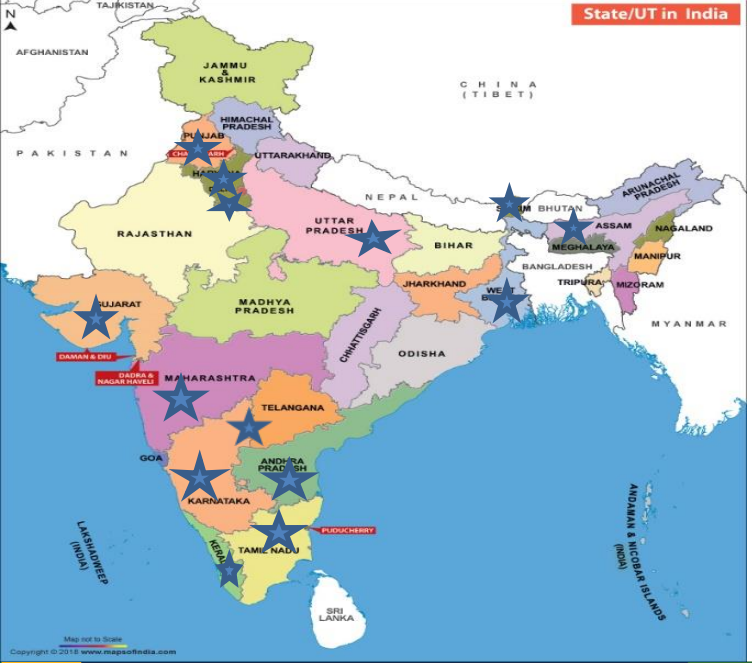
Training on Ethno-veterinary Science & Practice (EVP) for the last 12 years

- About 2000 veterinarians trained in EVP
- 61 vets completed EVP P G Diploma course
- 516 village resource persons
- 60 Officers from the various milk unions
- Over 30,000 farmers trained in various locations in India
- Dairy companies involved - NDDB, AMUL, Mesana, KMF, MILMA & MILK Unions from 14 states, Abbott,
- Universities - LUVAS, KVASU
- Organisations - KSVC, BAIF, Goat trust
- Sate Goverment - Sikkim, Haryana, Punjab



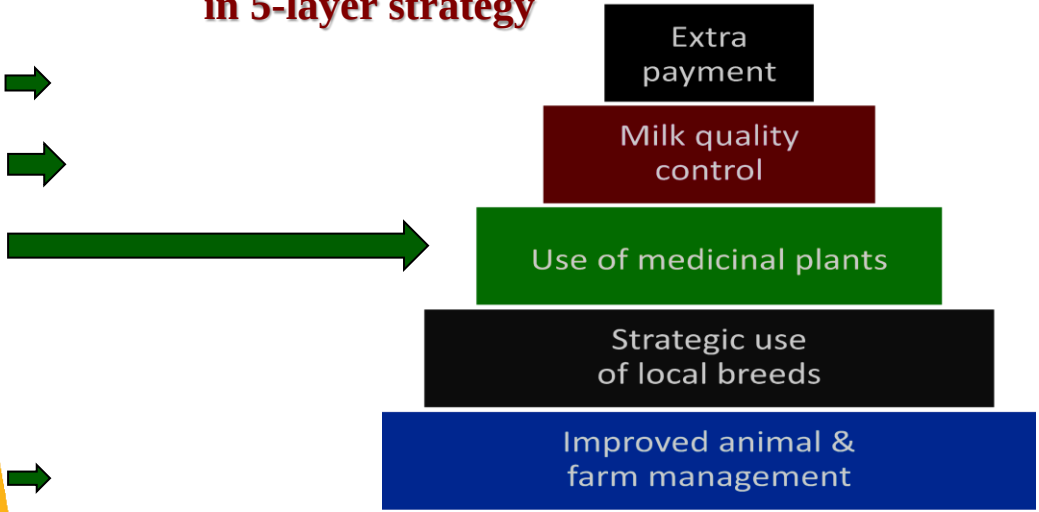
EVP training in 14 states

1. Andhra Pradesh
2. Assam
3. Delhi
4. Gujarat
5. Hriyana
6. Karnataka
7. Kerala
8. Maharashtra
9. Punjab
10. Sikkim
11. Tamil Nadu
12. Telangana
13. Utter Pradesh
14. West Bengal

International collaboration

- **Foundation for Natural Livestock Farming (NLF) Partners in Netherlands, Ethiopia and Uganda**

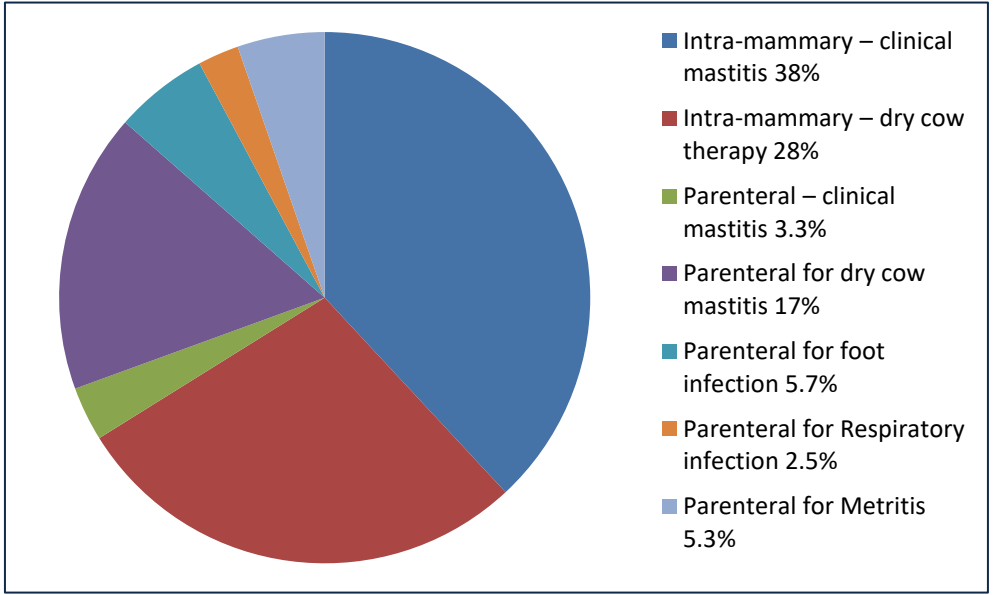
Antimicrobial reduction Approach: TDU-NLF India in 5-layer strategy



NDRI News April –June 2012 Vol. 17, No 1

- In the last 50 years the loss due to Mastitis in India increased 115 times
- The loss is Rs. 7165.5 crores (15,000 ?? Now) annually.
- The prevalence of the mastitis increased to more than 60 %

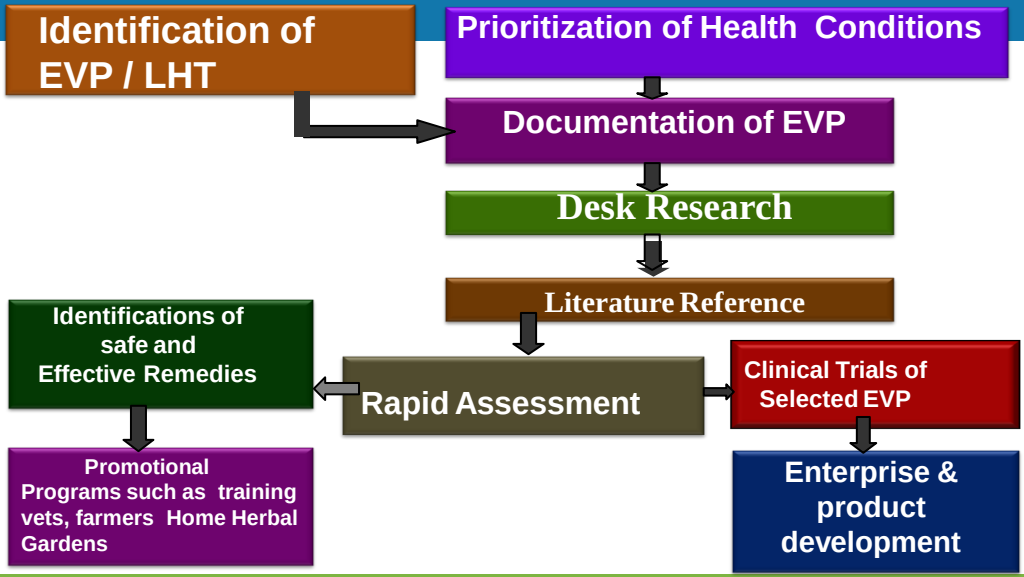
Pol and Ruegg 2007



Ethno-veterinary practices

- **We had documented Ethno-veterinary practices from 24 locations from 10 states**
- **Established that 353 out of 441 formulations documented are safe and efficacious.**
- **19 remedies have gone through clinical observation studies.**

Steps in implementing strategy



Example of EVP remedy for Mastitis








Note: In the case of chronic mastitis add *Cissus quadrangularis* in the formulation and the treatment should be continued till the hardness of the udder is completely disappear

Assessments - Ayurveda

- **This formulation consists of *Curcuma longa*, *Aloe vera* and Calcium hydroxide**

- **Have properties of Vrana shodaka (Wound cleanser), Vrana ropaka (Wound healing) and very good zhotha hara[4] (anti-inflammatory), Puti rodhaka (anti-infective) and Krimihara (anti-microbial)**

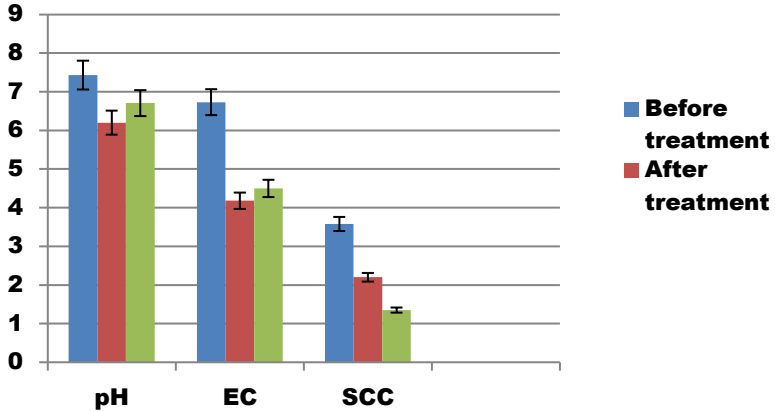
- ✓ **This remedy is very much beneficial in Mastitis.**

In-Vitro Antimicrobial Activity of Ethno-veterinary Herbal Preparation for Mastitis

The antimicrobial activity of aqueous, ethanol and ethyl acetate extracts obtained from *Aloe vera* and *curcuma longa* assayed in-vitro using agar well diffusion method exhibited antimicrobial activity against *Escherichia coli*, *Staphylococcus aureus* and *Pseudomonas aurogenosa*.

Dairy and Vet Sci J
Volume 3 Issue 2 - August 2017
DOI: 10.19080/JDVS.2017.03.555607

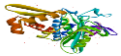
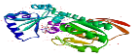
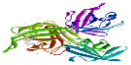
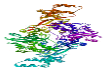
reduction of pH, Electrical Conductivity (EC) and Somatic Cell Count (SCC)before and after treatment with herbal formula in comparison with normal values.



Reverse pharmacology

The bioactive compounds were tested for its effect against the target proteins of *S. aureus* using molecular docking studies.

Punniamurthy et al. 2017.IJANS Vol. 6, Issue 5, Aug – Sep 2017; 23-30

Target	PDB ID	Structure of target	Total binding sites
BPL	3V7S		7
DNA gyrase	3G7B		5
opuCB	3O66		14
sirA	3MWF		7
SrtA	1T2W		14
PBP	3VSL		44

- **Many bioactive components of *Aloe vera* and turmeric interact with target protein**
- **component of lime had lesser interaction with lesser affinity**
- **The pharmacodynamics study using online server PASS reveal that the compound in the preparation posses anti-inflammatory and anti-microbial properties (Punniamurthy et al. 2017)**

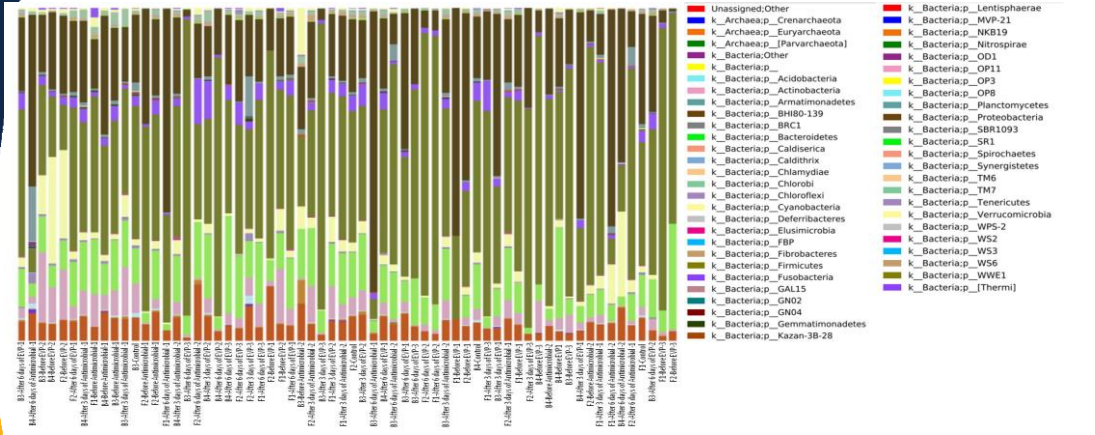


Figure 2: Bar plot of phylum level bacterial abundance of all 64 milk samples

Treated with Doecf + citriaxone +Sulbactum 3 gr + Melpol (Meloxium paracetamol) 15 ml + Avil 10 ML (IM). Treated for 5 days

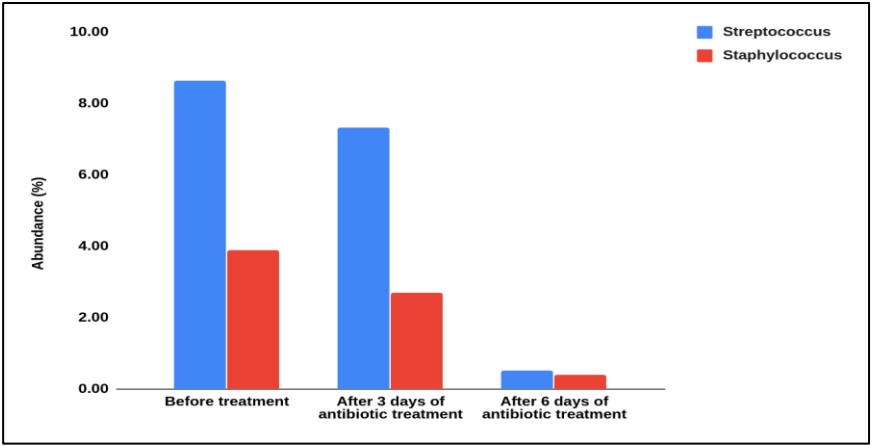


Figure 3b: Abundance of *Streptococcus* and *Staphylococcus* of control, Mastitis affected and antibiotic treated milk samples.

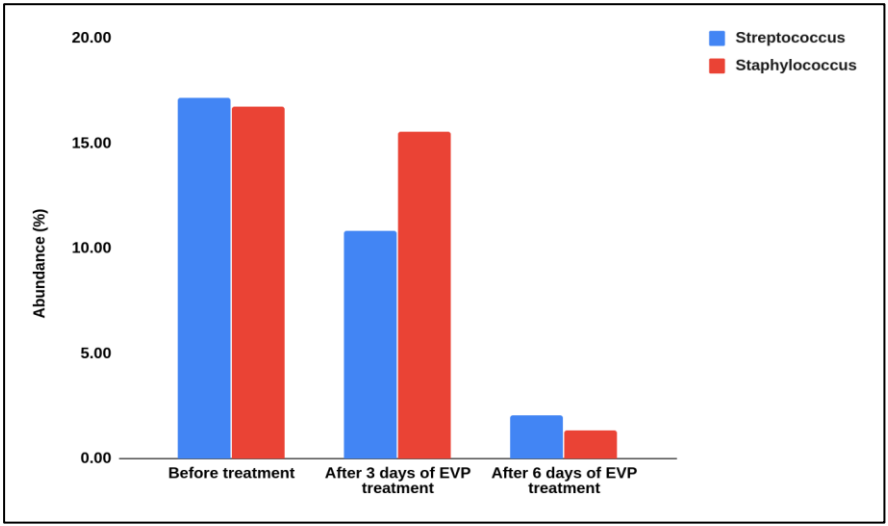


Figure 3a: Abundance of *Streptococcus* and *Staphylococcus* of control, Mastitis affected and EVP treated milk samples.

Changes in the microbiome of milk from the cows with clinical mastitis after 6 days of treatment with herbal formulations

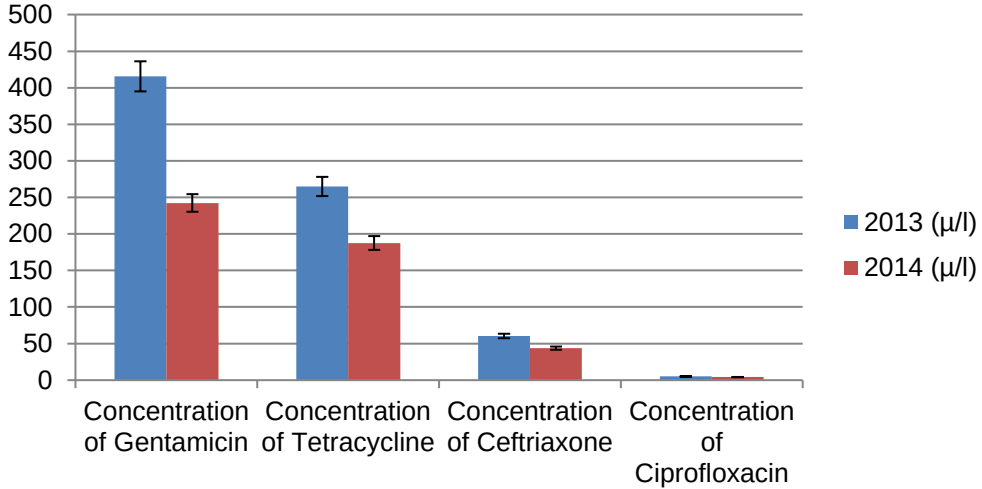
- **Average abundance of *Staphylococcus* was reduced from 40.59% to 2.03% (20 times),**
- ***Streptococcus* from 25.8% to 2.06 (12.52 times),**
- ***Pseudomonas, Pseudomonaceae* family 20.28% to 1.9% (10.67 times)**
- ***Klebsiella* from 8.4% to 0.26% (32.31 times)**
- ***Enterobacteriaceae family* from 24% to 1.69 % (14.37 times)**
- **Indicating the cure of mastitis (Hegde *et al.*, 2021).**

Feedback from various milk societies on Efficacy of EVP for Mastitis in cattle from 2017-18 to 2021-22

S. No	Mastitis	Total treated cases	Total clinical recovery	% clinical recovery
1	Acute Mastitis- NDDB	104475	82878	79.3
2	Chronic mastitis- NDDB	52791	41502	78.6
3	Sub-clinical Mastitis - NDDB	23986	19780	82.5
4	Mastitis (Abbott)	1692	1563	92.38
5	Mastitis (TDU)	1561	1432	91.7
	Total	184, 505	147, 155	84.9

It is a reasonably high outcome by any standard from the clinical point of view.

Antibiotic residue in the milk -µg/l in group used EVP alone (Average)



Antibiotic residue: Farmer Sample After one year intervention (Quinol. Genta, Tetra & Sulpha – Absent)

MILK Union	Number of farmers	Beta lactams Negative	Beta lactams Low Positive	Beta lactams Positive
Allapra	15	12	2	1
Arakkapady	15	11	2	2
Chakkampuzha	10	10	0	0
Maneed	10	7	3	0
Manikyamangalam	15	12	2	1
Monippally	10	6	2	2
Puthrika	10	10	0	0
Sreemoolanagaram	15	15	0	0
Thirukanurpatti (TN)	20	20	0	0
Aralumallige (Karnataka)	20	20	0	0
Total	140	123	11	6
Percentage of farmers		87.86%	7.85%	4.29%

Cost in Rs. for the treatment of Mastitis in cattle using veterinary drugs and herbal formulations

Disease conditions	Number of animal treated	Average expenditure for vet service.	Average expenditure for herbal medicine is used Rs	Amount saved in Rs
Mastitis	35	3000	120	2880

Cost impact (Production loss) when Western medicine and herbal formulations is used

S. No	Mastitis	N	Loss of milk/ day L	Loss for 6 days L	Financial loss
1	Allopathic treatment	35	2.5	15	390
2	EVP teatment	35	0.4	2.4	62.4
	(Rs 26 per liter)				

Reduction of disease incidence from 2016 to 2019

Disease	Mastitis		
Year	2016	2018	2019
Average per union	65.63	36.5	10.6
Per cent reduction		44.4	83.8

Herbal spray for Mastitis

R and D	remark
Ideation, 3 Months prototype	**4 prototype developed (March 2018 June 2018)**
Field trial for selection of beast combination	**Final combination is selected (Jan 2020)**
Testing & Validation, Field study	**Field study 1 ,2,** 90 % efficacious only 19 cases (only clinical mastitis) third study is on
Lab study done March 2020	Herbal formulation against mastitis had inhibitory activity against *E. coli* and *S. aureus.*
Microbiome study before and after treatment After 6 days of treatment with herbal formulations	the average abundance of ***Staphylococcus*** was reduced from **40.59% to 2.03%** (20 times), ***Streptococcus*** from **25.8% to 2.06** (12.52 times), **Pseudomonaceae family 20.28% to 1.9%** (10.67 times), ***Klebsiella*** from **8.4% to 0.26%** (32.31 times) and **Enterobacteriaceae family** from **24% to 1.69 %** (14.37 times)
Toxicological study	Done -Non toxic
Priority patent application	**Priority process patent application submitted**
shelf- life study	Good stability , **Stability up to 1 year**
Phytochemical study	Will have to do
Clinical trial	Will have to do
Scale up manufacture and sale	By end 2022

conclusion

- **Adopting the Ethno-veterinary science and practices to combat infectious diseases in livestock has been identified and tested as a key game changer in reducing the use of antibiotic in veterinary practices**

Future solution for the global concern

- **A trans-disciplinary research framework that combines network pharmacology, combinatorial chemistry, pharmacogenomics and pashu Ayurveda hold the future solution for the global concern about chemical residues in animal products and AMR**

What TDU can share with others

- Train on documentation of local health tradition and resources
- Train stakeholders on use of herbal medicine on common cattle diseases and produce antimicrobial residue free milk
- Establish Home/institutional herbal gardens
- Pilots with herbal remedies

Thank You