

# Novel Technologies in Udder Health Management Suitable for Small-hold Farmers

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# Lecture Plan

- Importance of data in udder health management
- Housing- a key component of the strategy
- Preventing pathogen- invasion- New technologies
  - Barrier Technology
  - Solvent based Novadip
  - Post-milking Barridip
  - Green-T-Sealant
  - Leaky Udder Management

# What is udder health management?

- Management is the coordination and administration of tasks to achieve a **goal**.
- Such administration activities include setting the **strategy**, coordinate human efforts to accomplish the set objectives through the application of **available resources**.

**1. Setting objectives-** Reduce incidence of mastitis, **Culling rate** due to mastitis, **Reduce somatic cell count** in milk, **reduce milk rejection** due to high somatic cell count

**2. Organizing people-** the goals should be aligned with all stakeholders

**3. Devising systems of measurement**

**Measurement is the key to management- If you cant measure you cant improve**

# Data Requirements for Udder Health Management

- Somatic Cell Count- at various stages of lactation
- Mastitis cases with information on DIM- strategies will be different
- Milk Yield data – Mastitis Vs normal – to understand losses
- Drugs used in treatment- success vs Failure rates
- Antibiotic sensitivity profiling data over the year
- Cost of treatment of udder infections
- Udder health vs uterine health and fertility
- Dry cow therapy impact
- Teat dipping – traceability
- Culling due to udder infections
- **Benchmark estimate to start with**

# Prediction, Early Warning, Precision- Core Requirement is Record Keeping

- QR coded Ear Tag for Identification and Traceability
- Cell phone App for Data capturing from animal-side, easy data update and access
- Tele-veterinary App for remote diagnosis and treatment
- Management system for milk processing companies / veterinary managers
- Dashboard for service tracking and maps

# Our Patents- Encrypted QR coded and HF-RFID Tags

- **Current requirement is Traceability**
- Should be able to access animal's data right in the farm
- Should be able to update data from animal-side
- No additional gadget- cost effective to roll out
- TraceTag and RF-TraceTag: New Generation ear tag, same cost but tons of additional benefits
- Scan the code with App on cell phone to register and data update

Service Data Update  
Stray Cattle  
Cattle In Transport  
Cattle in conflict



# Linear / QR code and RFID Scanner Cum Data Management App

- Register animal
- Data Update - AI / PD / Vaccination / Treatment Data update from animal side
- Daily Action List – Heat, PD check, calving, vaccination, treatment, milk record, etc.
- Alarm List – Under-performing animals- Longer calving to conception interval, Repeat breeders, etc.
- Non-pouring / Defaulter farmers:



# Herdman-Mobivet Platform

- **Tag-N-Trace - Scannable New Generation Ear Tags**
- **Mobivet- Cell Phone Scanner cum Data Management App**
- **Server Software – for big data analysis**
- **Dashboards, service, insurance and loan repayment monitoring**
- **SMS-Messages, Missed-call Service, Notifications**
- **Data Portability from and to ERP / Milk Collection Centres**
  - **Antibiotic / drug use**
  - **Non-pouring farmers**
- **AI-applied Forecasting for better planning and business decisions**
- **IoT interface – Direct porting of the data into animal files**
- **Interface with Tele-veterinary Devices**



# Elements of Udder Health Management

- Part of overall Herd Health Management
- Monitor – subclinical mastitis
  - CMT, Trypsin Inhibitor, SCC
- Treatment of clinical cases
  - Intracellular Staph
  - Withdrawal period
- Milking management, udder hygiene
- Dry Cow Therapy

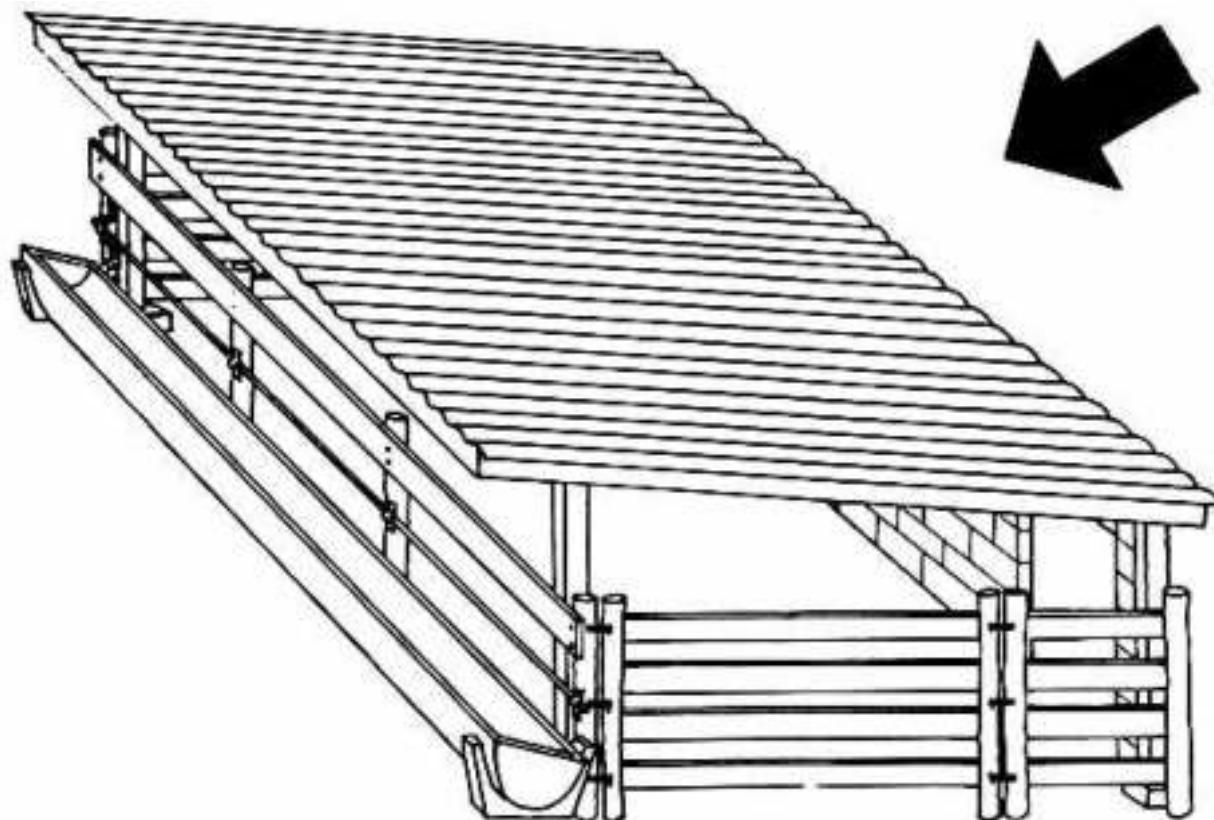


# Animal Housing – Important to control udder infections

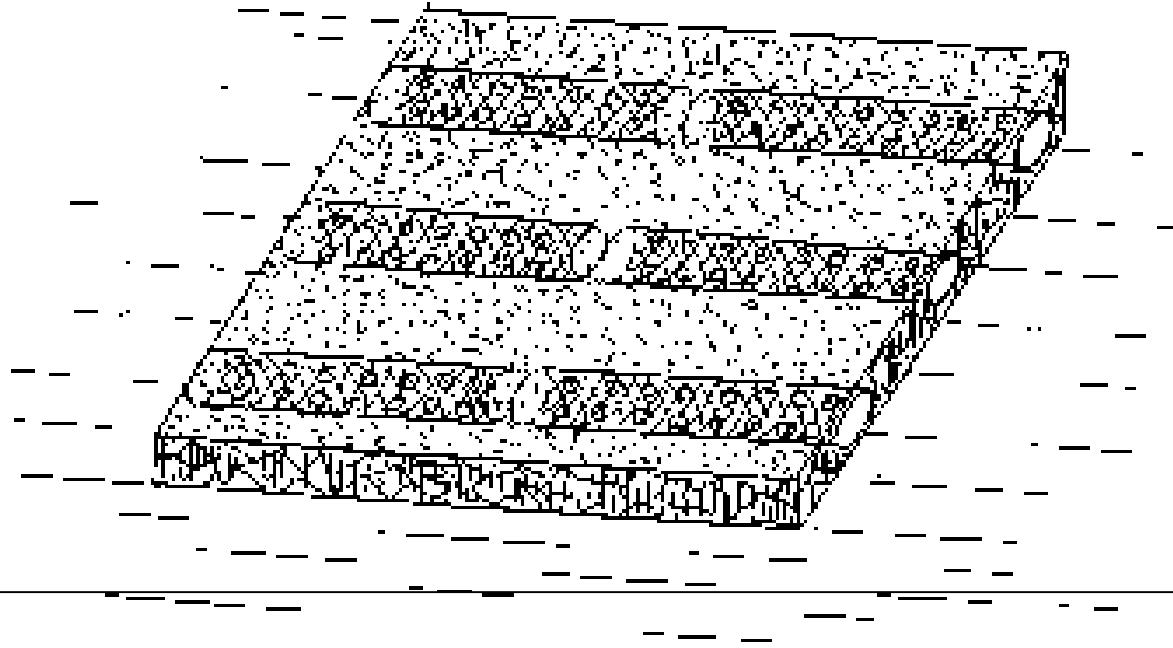
- This is a neglected area of concern in developing and under-developed countries
- Either farmers are forced to invest heavily or nothing is invested
- Cow's needs of housing are different – cow comfort important
- For udder health floor is important-
- Cement-concrete / brick being non-absorbent will not remain dry
- Humidity and liquified dung-breeding ground for bacteria



# Correct Housing for High Rainfall Climate



## Proper construction of floor and its maintenance



The floor should have good draining capacity and should be properly leveled. For good drainage we lay under the ground down perforated PVC pipes on both the sides and the level is raised to 9 inches above the ground. The final surfacing should be with 'murum' that is nicely pressed with heavy roller





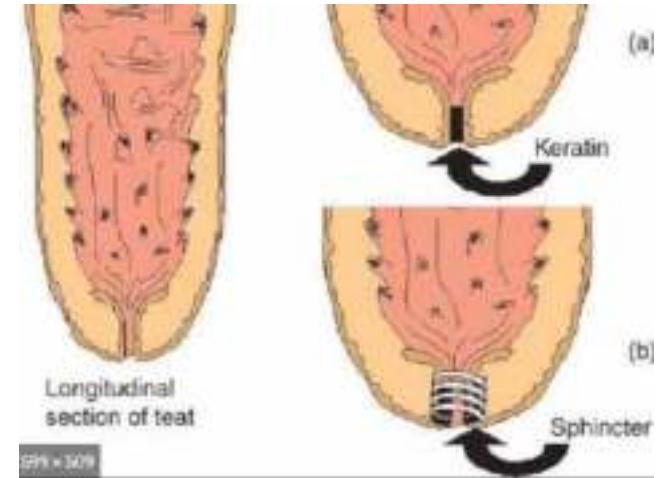


# Treatment of Clinical Cases

- Do not treat Sub-clinical mastitis cases
- All clinical cases should be promptly treated
- Reliance on antibiotic sensitivity in individual milk samples is questionable.
- It should be used to develop frontline and secondary therapeutic approaches
- Repeated removal of milk, use of oxytocin to empty udder helps a lot
- In acute mastitis cases cold fomentation and anti-inflammatory drugs

# Novel Technologies: Prevent Invasion of Pathogens

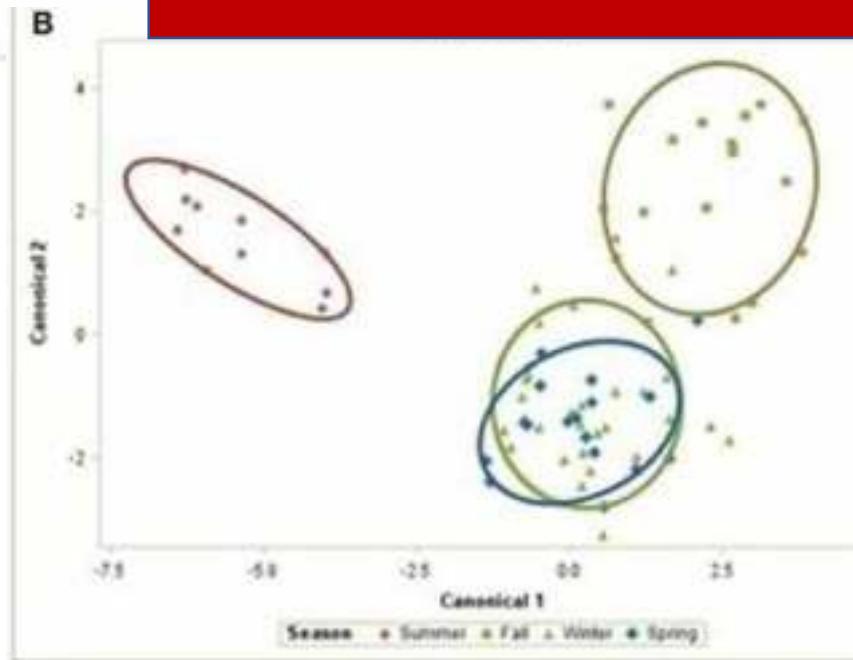
- Teat Sphincter- First line of defence to pathogens
- Post-milking sphincter relaxation – If animals do not feed after milking
- Dry Period - one week after drying off and two weeks before calving
- Lung-Uterus-Udder route of bacterial metastasis



With advent of high throughput bacteria identification systems large data on microbiome is now available. Microbiota play important role in local immunity and overall health

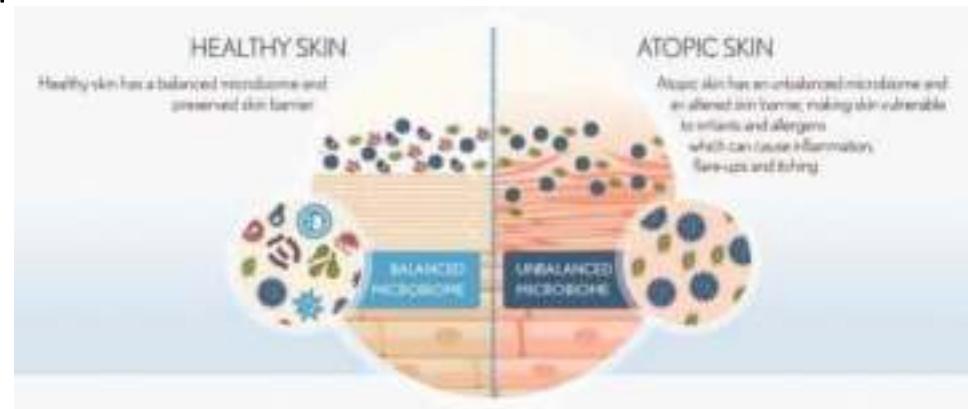


When antibiotics and germicidal substances are used these not only kill pathogens but also kill useful microbiota



# When microbiota become pathogen?

- When these get dislocated from natural predilection site
- When ratio between good and bad bacteria is tilted towards bad
- Teat skin bacteria – teat canal
- Teat canal bacteria – Teat cistern and alveoli
- Skin bacteria entering in vagina and cervix
- Vaginal bacteria – uterus
- Upper respiratory bacteria entering lungs

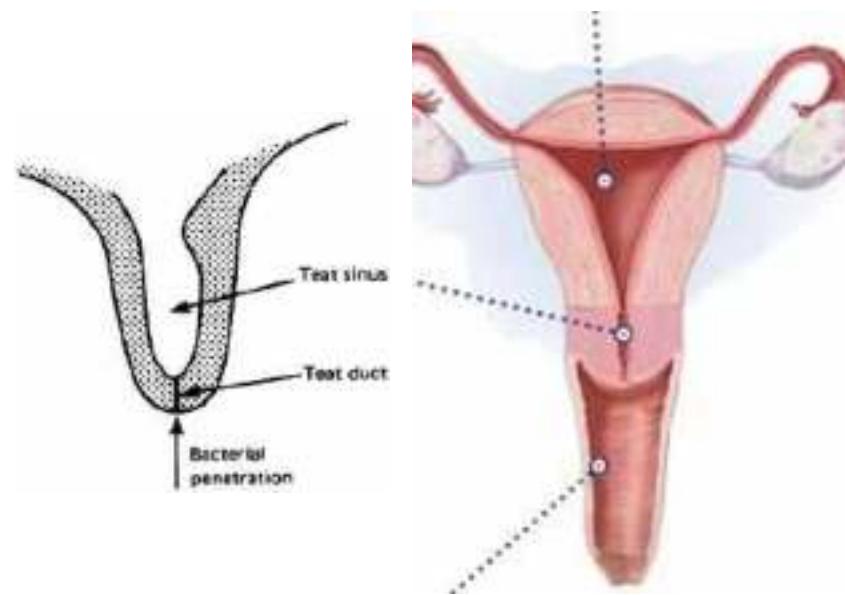


# Novel Barrier Technology

- Antibiotics, antibacterial and chemicals alter microbiota with long term consequences
- Intramammary formulations
- Teat Dip
- Dry Cow Therapy
- Intra-uterine / Intravaginal
- What is the solution?
- Since infection occurs when bacteria enter the body through natural orifices a better option will be:
- Put a chemical barrier to entry of bacteria without changing the micro-environment

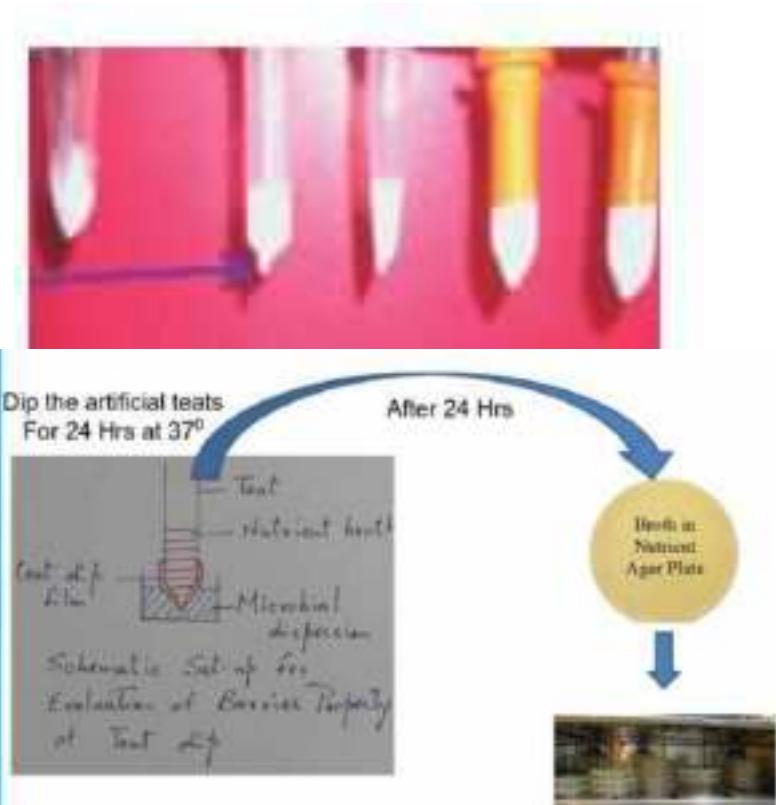
# What is Barrier Technology?

- We have developed polymer-based formulation that after application forms a chemical film that acts as physical barrier to entry of bacteria



# Barrier to entry of bacteria

- Polymer matrix that forms a film pore size is less than 0.2 micron, permit aeration and offer physical barrier to micro-organisms
- We use different classes of polymers – (a) ion-dependent polymers, (b) temperature-dependent sol-gel (c) pH-dependent polymers and (d) neutral-polymers
- The platform technology can be used to develop numerous formulations
- We use polymers derived from natural sources (not synthetic) that are biodegradable, available in plenty and inexpensive – keep cost low
- Simple formulation technologies- no major or intricate infrastructure is needed to manufacture



# Our Technology is True Barrier Technology

## Results:

	TEAT	Swabs S. aureus	
		Intern	Extern
Positive	NOVADIP	negative	> 150 CFU*
	Product 1	negative	> 150 CFU*
	Product 2	105 CFU*	> 150 CFU*
	Controle	> 150 CFU*	> 150 CFU*
negative	NOVADIP	negative	negative
	Product 1	negative	negative
	Product 2	negative	negative
	Control	negative	negative

	TEAT	Swabs E. coli	
		Intern	Extern
Positive	NOVADIP	negative	> 150 CFU*
	Product 1	negative	> 150 CFU*
	Product 2	> 150 CFU*	> 150 CFU*
	Controle	> 150 CFU*	> 150 CFU*
Negative	NOVADIP	negative	negative
	Product 1	> 150 CFU**	negative
	Product 2	negative	negative
	Controle	negative	negative

*Study conducted at Ghent University, Belgium*

# Novadip

- This is solvent based dip which dries very fast
- Forms a film which remains for a week if not removed
- Stronger film
- Indicated as preventive with dry cow therapy, pre-parturient milk leakage, Pre-parturient high risk cows and buffaloes
- **Post-dry cow therapy**
- **Leaky teats in dry period**
- **Loose teat sphincter syndrome**
- **Two weeks before calving as strategic preventive**
- **Sale of to-calf cow / buffalo to protect against new environment bacteria**

# Baridip- Teat Dip

- **Barridip** is a novel aqueous product based on ion-dependent polymerization.
- **Germicidal teat dip destroy good bacteria required for cheese flavour and shelf-life**
- Desired features:
  - Forms barrier film instantly
  - The film formed is reinforced film so that it is resilient for breaking
  - Water-soluble constituent but once the film is formed it is hydrophobic hence no effect even when animal sits on wet floor
  - Pore size less than 0.2 micron but allows aeration
  - Easy to come out with little agitation at the time of milking
  - **No antibacterial chemicals added – Green**
  - **No chemical residues, the polymers we use are in fact edible polymers**
  - **Cost effective**
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## Dipping Technique: Results

- -ve: negative control
- +ve: positive control
- ACC 1M: Accelerated stability samples, at 1 month time point.
- Accelerated conditions:  $40^{\circ}\text{C} + 2^{\circ}\text{C}$   
 $75\% \text{ RH} \pm 5\% \text{ RH}$
- RT 1M: Room temperature stability samples, at 1 month time point.



Results:  
No growth was observed in  
any of the samples.

# Green-T-Seal- Barrier-type Dry Cow Therapy

- **Earlier Product:** We have earlier developed a product on sol-gel principle that is it is in solution form but gels at body temperature
- Antibiotic neomycin has been suspended in such a way that it is released for 45 days at therapeutic concentrations
- **New Product:** New formulation is based on the principle that teat cistern and canal has numerous good bacteria that will also be affected when antibacterial is used.
- Instead, the entry of bacteria through teat orifice can be prevented by a barrier seal.

# Green-T-Seal- Radiographic evidence

- Formulation composed of naturally occurring polymers
- Two polymers to reinforce the matrix
- No antibiotic required, in vitro studies show that the seal formed is complete and does not allow entry of bacteria for a period of 45 days under experiment
- The seal remains for as long as it is not removed by stripping
- Cost effective



# Leaky Udder

- Before parturition in few cows there is let down and milk starts flowing
- Common in high-yielding cows
- General principle- If milk is there in udder it should be removed
- Nearing calving – terminate pregnancy –Dexamethasone 40-60 mg, termination 48-72 hours
- Withdraw feeding of concentrate
- Check body Condition Score – should not go beyond 3.75
- Calcium and phosphorous in feed – sphincter patency

•THANK YOU