

# MASTITIS PREVENTION AND TREATMENT

## (Level 3)

Topic	Training & information Content
9.1	Introduction to Animal health (Prevention vs curative health care)
9.2	Health signals
9.3	Biosecurity of dairy farms
9.4	Tick born diseases (Prevention and treatment)
9.5	Worm infections (Prevention and treatment)
9.6	Vaccination schedule and planning
9.7	Mastitis prevention and treatment
9.8	California Mastitis Test
9.9	Usage and storage of veterinary medicines on dairy farms
9.10	Administering of medicines to dairy cows
9.11	Instruction use of injectors into teat canal
9.12	Key performance indicators (KPIs) for monitoring health status of dairy herd



## 1. You will learn about (learning objectives):

- What mastitis is.
- What bacteria are.
- What somatic cells are.
- How to prevent mastitis.
- How to milk a cow.
- How to clean and disinfect (hygiene)
- How to treat mastitis.

You will learn the theoretics and understanding behind the job. Only practice can give you the skills!



## 2. Introduction

Why prevention and treatment of mastitis is important:

- Healthy udders produce more milk.
- Healthy udders produce healthy milk for healthy people.
- Udder infections lead to extra labor and costs for treatments.

Mastitis is the main udder problem and a common disease on most dairy farms.

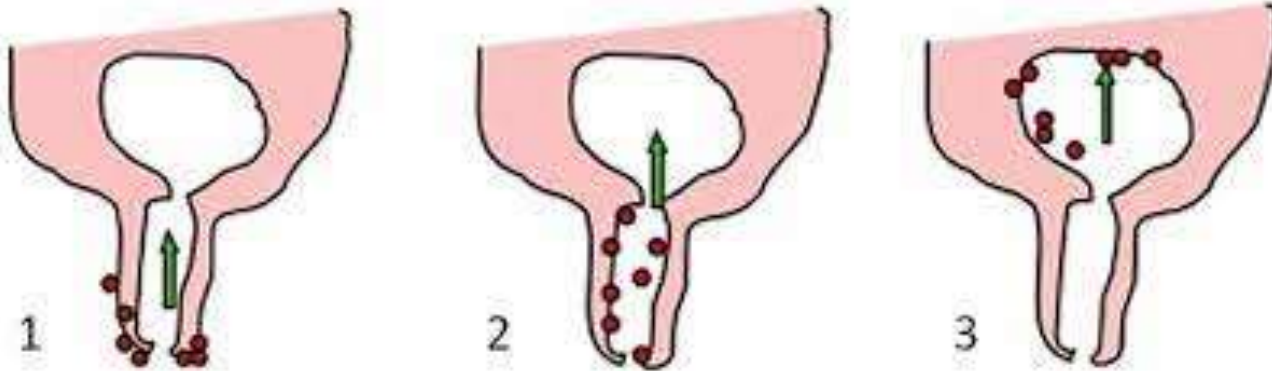
**Prevention of mastitis is the key!**



### 3. Background: Udder infection

- Mastitis is an udder infection caused by bacteria entering the teat canal.
- 'Mast' means breast in old Greek while '-itis' means inflammation.
- The symptoms of an inflammation are:

Redness	Rubor
Swelling	Tumor
Warm	Calor
Pain	Dolor

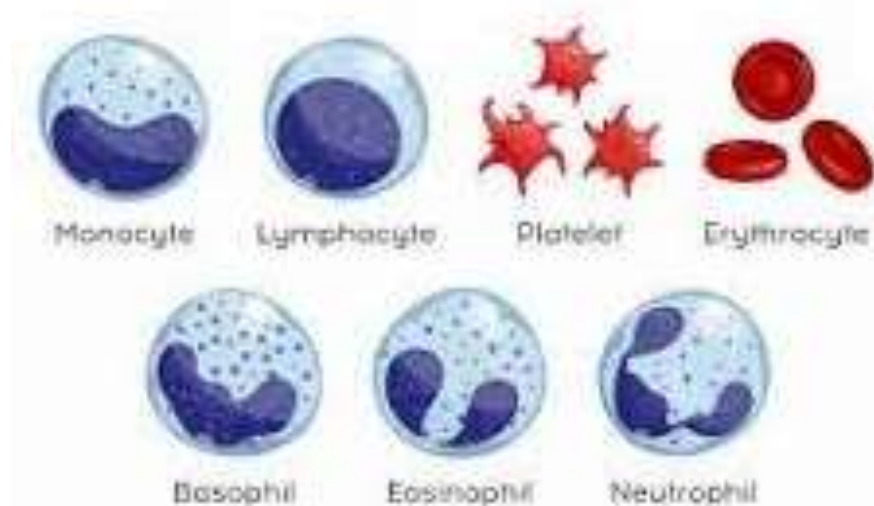


Bacteria entering the teat canal

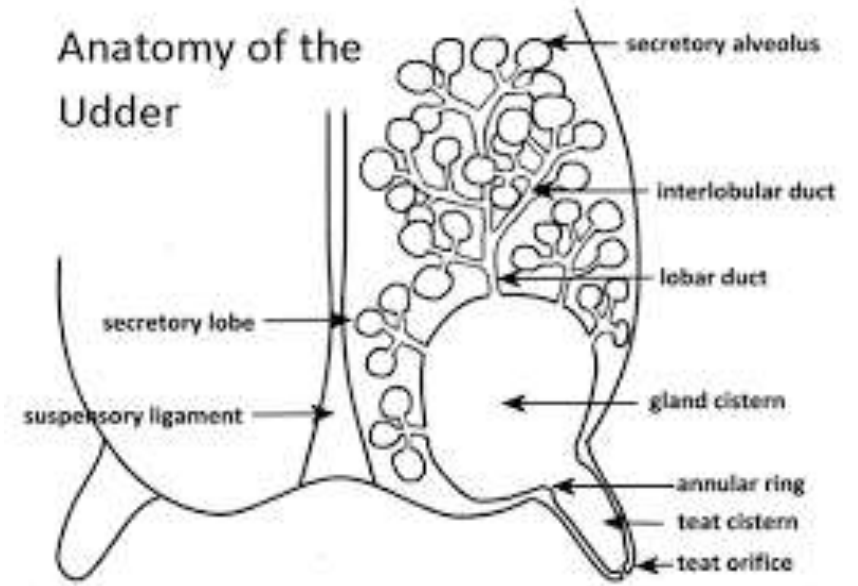


## 4. A bacterial infection, what happens?

- Bacteria cause an inflammation of body cells.
- This can lead to mastitis; hot red, warm, painful and swollen udder and visibly changed milk. This we call clinical mastitis.
- Sometimes symptoms are not sensible but body cells die and get into the milk. This we sub-clinical mastitis.
- These body cells consist out of white blood cells attacking the bacteria and dead epithelial and gland cells. A difficult word for body is somatic, so the somatic cell count in milk will be increased.



Different types of blood cells, the blue one are the white blood cells.



**Tip:** White blood cells are part of the immune system. They kill bacteria directly or make antibodies so that macrophages can destroy them.

## 5. Signs of mastitis

### Clinical mastitis

- The first sign of clinical mastitis is often abnormal milk:
  - Milk will have clots.
  - The colour of milk can change.
  - Milk can become orange and watery.
  - Milk yield is going down.
- In some cases;
  - The udder swells.
  - Possibly lumps can be felt in the udder.
  - The udder can become red and hard.
  - Touching the udder can become painful.
- In severe cases;
  - The cow can get generally ill and develops fever.
  - Food intake stops.
- In very severe cases;
  - The udder goes blue and tissue dies.
  - Cattle die.
  - This can happen when *E. Coli* or Klebsiella bacteria cause the mastitis.



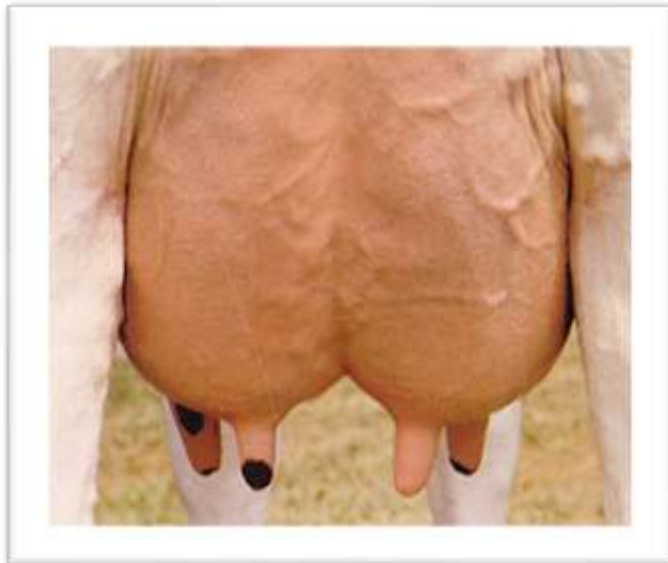
## 6. Type of mastitis

### Clinical mastitis

- Mastitis with clear symptoms like a red, swollen, warm and painful udder. Changed milk with clots and possibly fever is also manifested.

### Sub-clinical mastitis

- Mastitis with no clear signs. The cow is visibly healthy and the milk is visibly unchanged.



**Tip:** To detect sub-clinical mastitis, it is important to solve a mastitis problem at a farm.

Healthy udder

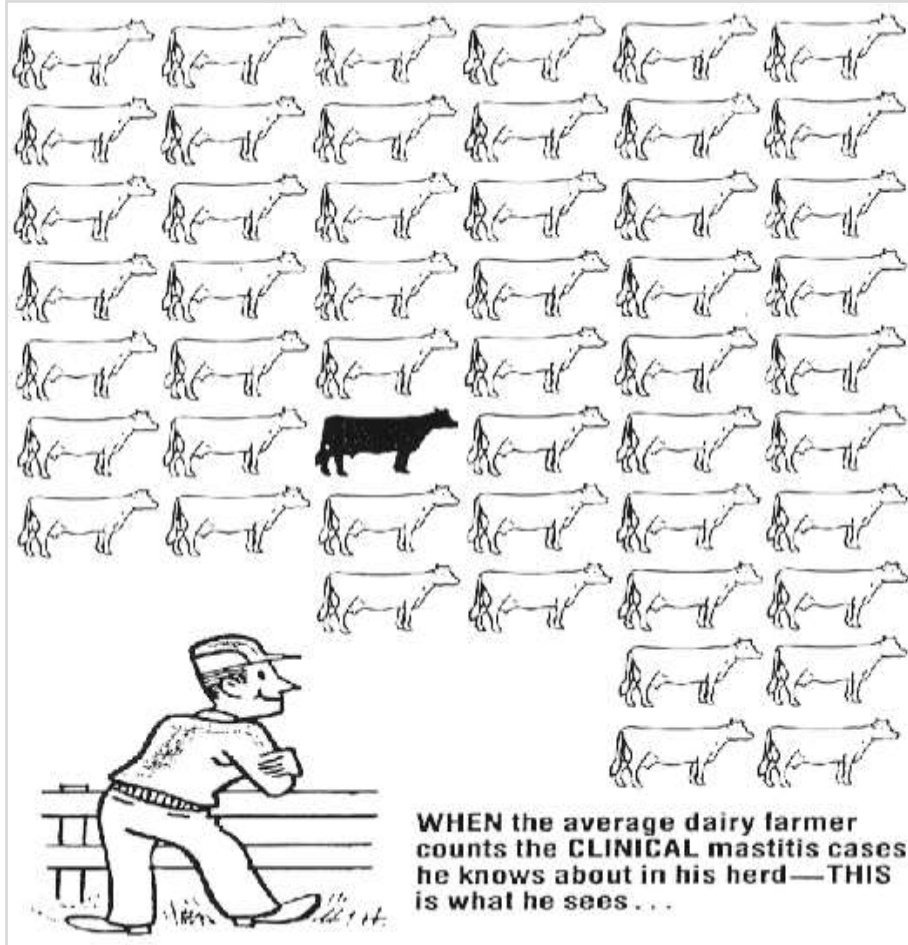


Three cattle with severe and very severe mastitis.



## 6.1 Clinical and Sub-clinical mastitis

### Clinical mastitis

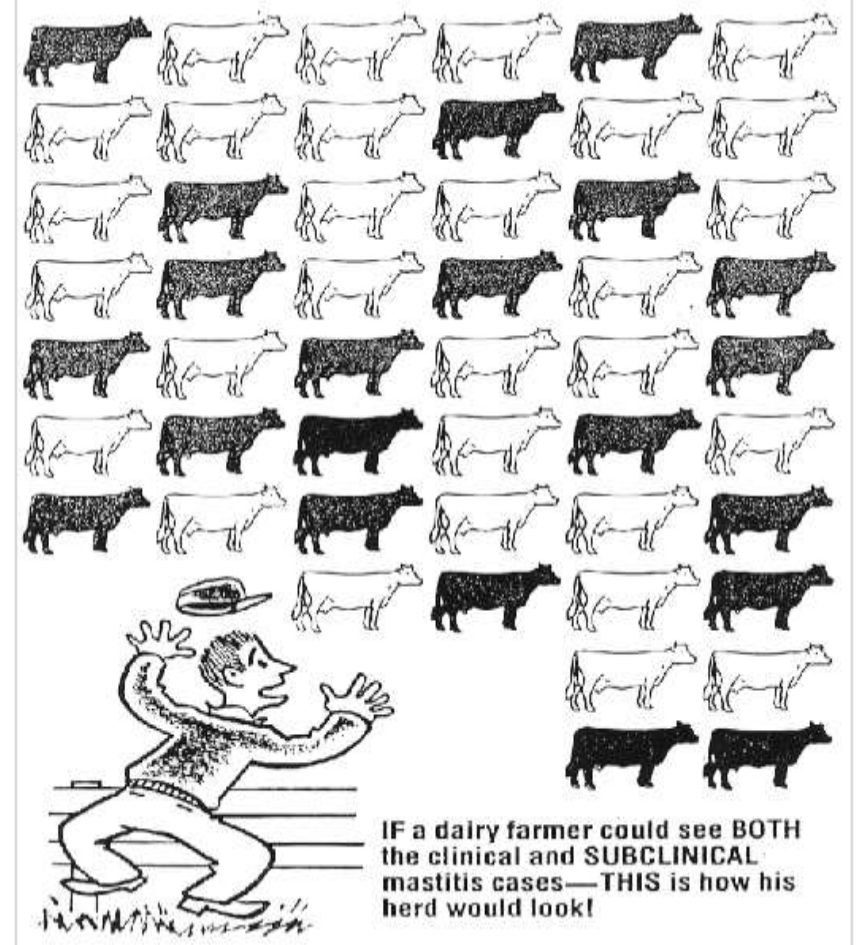


When only looking at clinical mastitis, problems can be underestimated.

Also cattle with sub-clinical mastitis have a problem.

- They produce less milk,
- And the milk quality has gone down.

### Sub-clinical mastitis

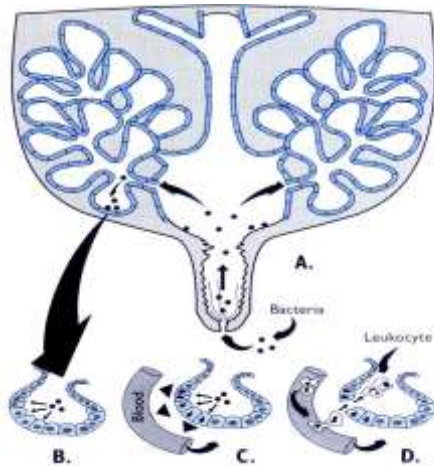




## 7. Sub-clinical mastitis and Somatic cell count

The main symptom of sub-clinical mastitis is an elevated somatic cell count (SCC). That is;

- The pathogen bacteria cause an infection.
- More udder cells die.
- White blood cell enter the area to fight the bacteria.
- More cells as normal will appear in the milk.
- Arbitrary: when more than 250,000 cell/ml are in the milk, one speaks of sub-clinical mastitis
- The milk can be tested on cell count by the **Californian Mastitis Test**.



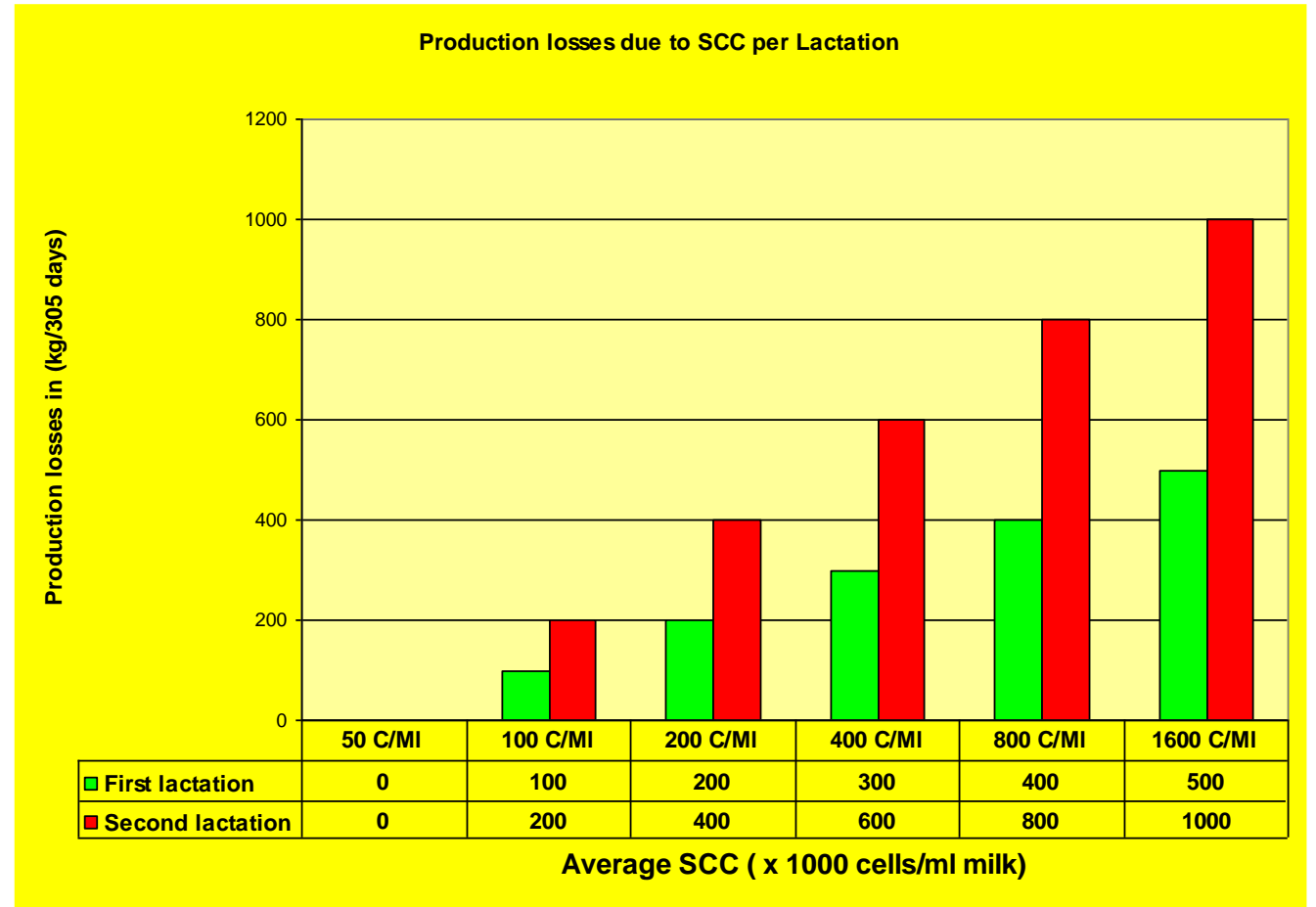
Performing a CMT is of great help to improve udder health. The details are discussed in another PowerPoint presentation.

## 7.1 High Somatic cell count

Why you should not want to have high somatic cell counts:

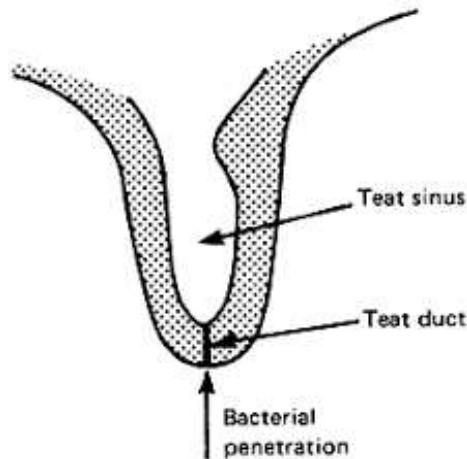
- i. Milk production decreases.
- ii. By a slightly elevated cell count of 400 cells/ml/cow, it is already estimated to affect 400 litres of milk per lactation (see graph)
- iii. Composition (quality) of milk decreases.
  - salt levels are elevated.
  - casein levels also go down, so less cheese can be produced from 1 litre of milk.
- iv. Risk for developing clinical mastitis increases.

**Important note:** By the way, Cell counts will never be zero. Also in a healthy udder cells will die and enter the milk.

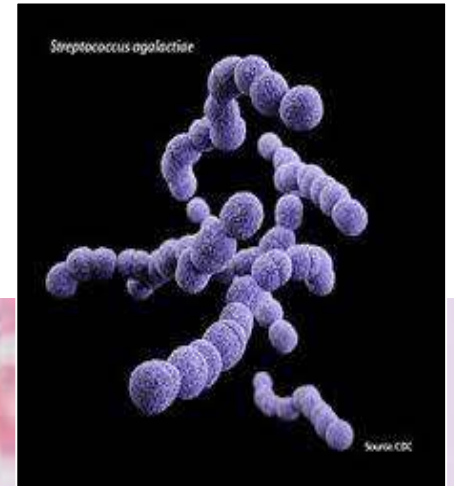


## 8. Prevention of mastitis

- All (99.9%) cases of mastitis are caused by bacteria.
- These bacteria enter the udder through the teat canal (not through the skin or by ingestion through the mouth or lungs).
- So prevention focuses on;
  - protecting the teat canal (milking technique) and
  - decreasing the number of bacteria around the teat canal (hygiene).



*Streptococcus agalactiae*



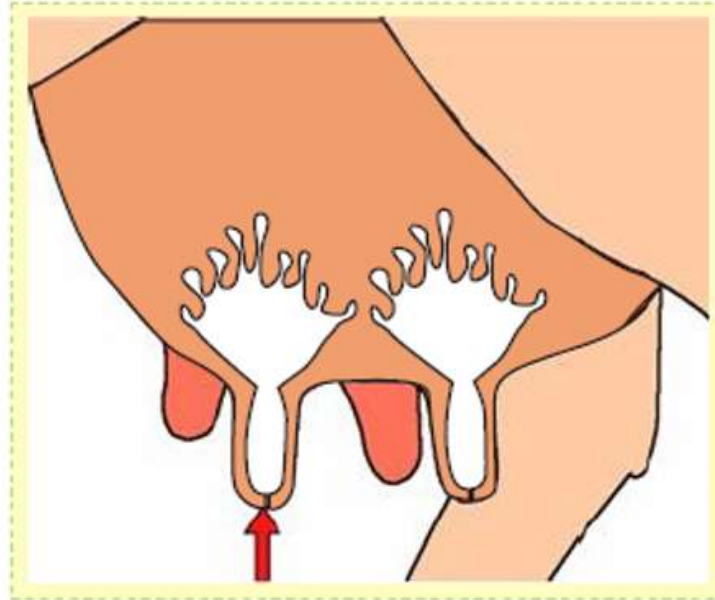
*Streptococcus agalactiae*, a bacteria causing mastitis.

- Inset: with huge magnification in electron microscope.
- Above: in rows between somatic cells.

## 8.1 Background on prevention of mastitis



- The teat canal is open during milking and or suckling and for some minutes after it.
- This is the moment bacteria can enter the udder.
- So, special actions can be taken during and just after milking.



- A healthy teat canal is closed.
- Teat canals can be damaged, this increases the risk of developing mastitis.
- Two of the main reasons for damaged teat canal is a wrong milking technique or a malfunction milking machine.

To prevent mastitis:



Keep bacteria away from the teat end.

- Good hygiene & good milking technique are the key in preventing mastitis!

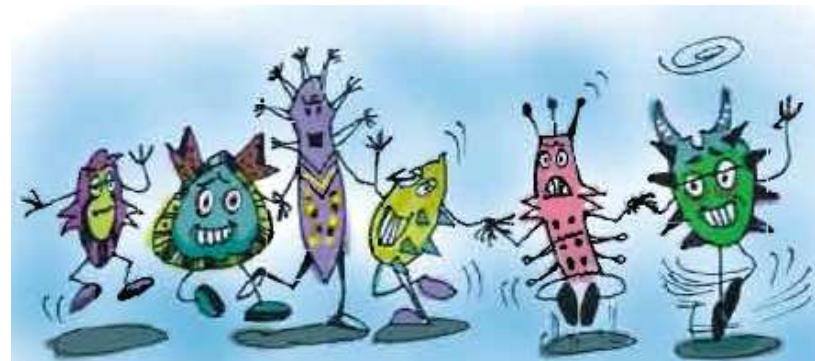


## 9. Bacteria

- Bacteria are small little (one celled) animals, which you can not see by the eye.
- Bacteria multiply very quickly under good circumstances such as;
  - i. Wet
  - ii. Warm
  - iii. Plenty of food (Milk)
- Bacteria live on:
  - the cow herself
  - other cows
  - the milker
  - milking equipment
  - the surrounding.



Bacteria die in a sunny, hot and dry environment.



## 9.1 Bacteria Cont'd...

- Bacteria are everywhere!
  - On the farmer
  - On the cow
  - On the floor
  - On milk equipment
  - On towels.



Dirt contains a lot of bacteria



Old and dirty milk can



Manure is full with bacteria

## 9.2 Bacteria are very small

- Bacteria are very small and cannot be seen by the eye, you need to enlarge the with 1,000 times before you can.



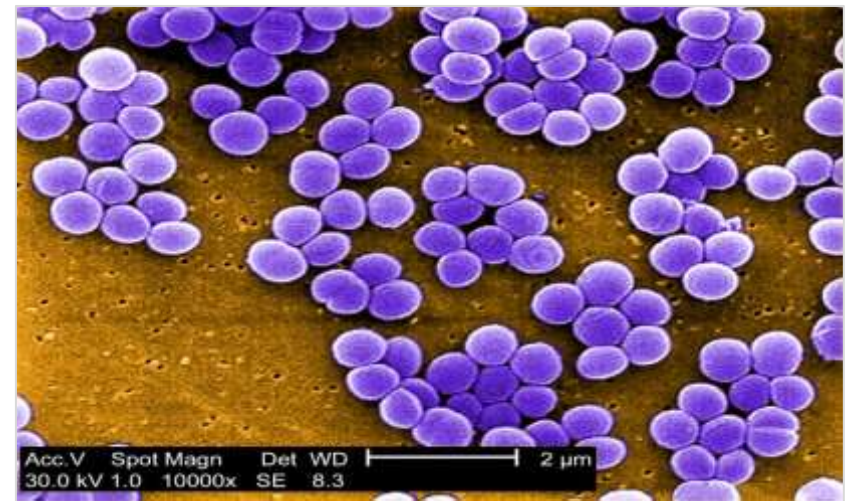
Bacteria colonies on an Agar plate.



Another way to make bacteria visible is by growing them on a plate. They multiply so quickly, that after a few days they become visible as a colony.



*with microscope which can multiple the view 1000-1500 times, we can see bacteria.*



## 10. Tackling mastitis holistically

- If you make a company strategy to prevent (sub-) clinical mastitis on a dairy farm, there are a couple of issues to take into concern;
  - Cow environment
  - Milking procedure
  - Milk technique
  - Monitoring
  - Culling and breeding
- All these issues are strongly interacting. Messing up one item while doing all other satisfactory can still lead to big problems.





## 11. Cow environment

- The aim is to keep the area around the teat end as clean as possible to minimize the chance of bacteria entering the teat opening. So:
  - Udders should be kept clean by having clean places to lay down. Pasture is excellent.
  - Have a clean place where cattle are milked.

Cubicles and walking areas should be cleaned regularly (at least twice a day).



One can ask, why is this man milking on dirty soil while 5 metres further he can milk in clean grass?

## 11.1 Cow environment Cont'd...



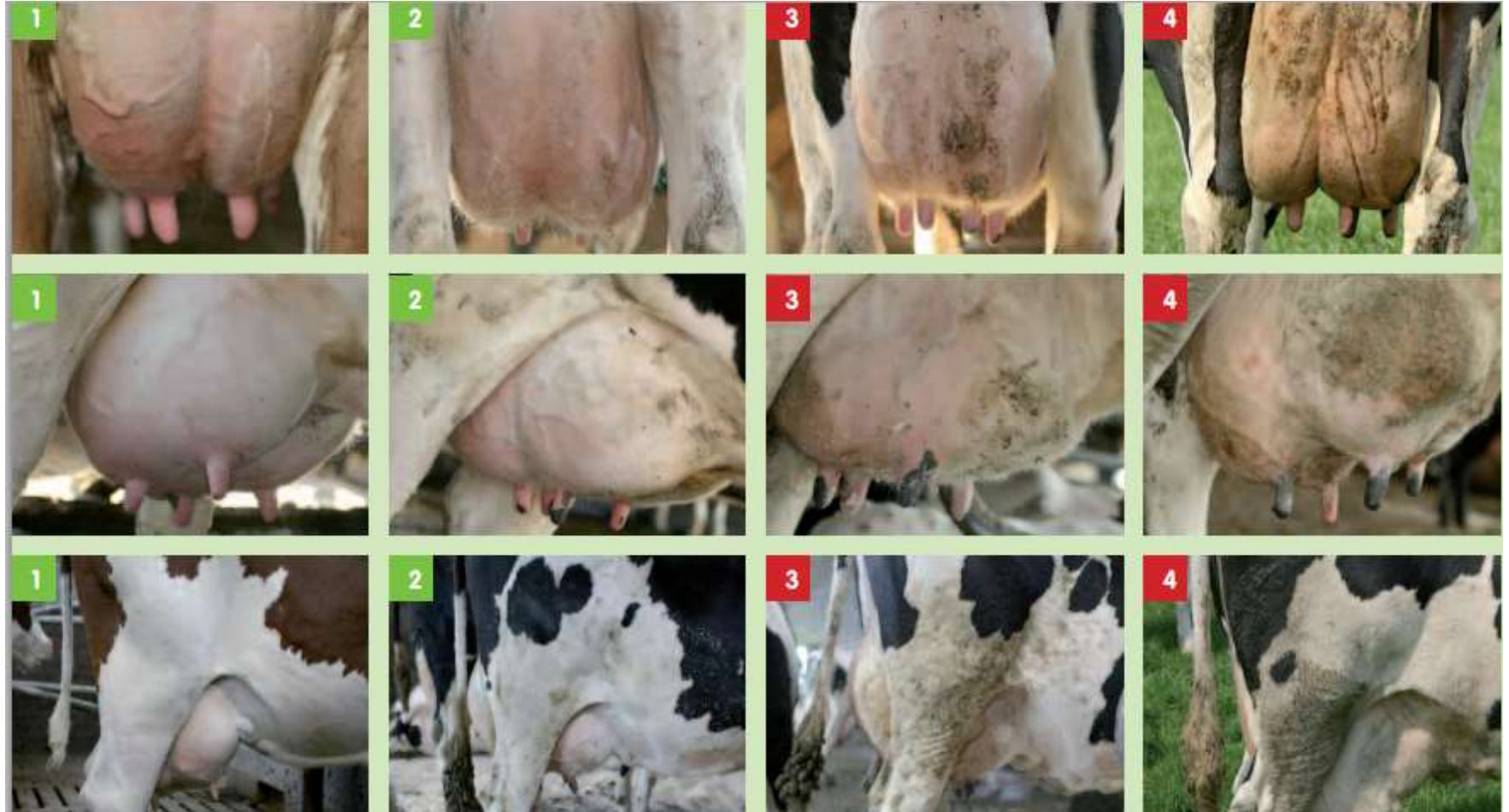
Milking in the mud.  
The big reason for increase in mastitis cases during  
the rainy season.  
Milking in the pasture is an excellent alternative.



This milking parlour looks clean.  
The cattle are clean as well.  
But bacteria spread much easier in a wet environment  
than in a dry one.

## 12. Hygiene score

- The Dutch Animal Health Service provides this hygiene score card.
- Research showed that farms with slightly elevated cell counts in milk had 5 times more cattle with hygiene score 4 compared to dairy with an average cell count.



## 13. Milking procedures

- We take a look at 10 steps.
  1. Check milk equipment.
  2. Clean milk place
  3. Take care of personal hygiene
  4. Clean teats and massage the udder
  5. Check the first milk
  6. Milk in the correct way
  7. Dip teats
  8. Keep cows standing after milking
  9. Filter the milk
  10. Clean milk equipment



## 14. Step 1: Check milking equipment

- Milk equipment is clean and dry.
- When buckets and churns are stored upside down water can run out.
- Milk towels have to be cleaned and dried daily.
- Use your nose to check (smell).



## 15. Step 2: Clean milk place

Why?

- To reduce the number of bacteria.

How?

- Remove shit and feed remnants.



Try to avoid using water.  
You do not want to milk in  
a wet environment.



## 16. Step 3: Take care of personal hygiene

- Clean clothes and washed hands also contribute to prevention of mastitis.



Wash your hands properly.



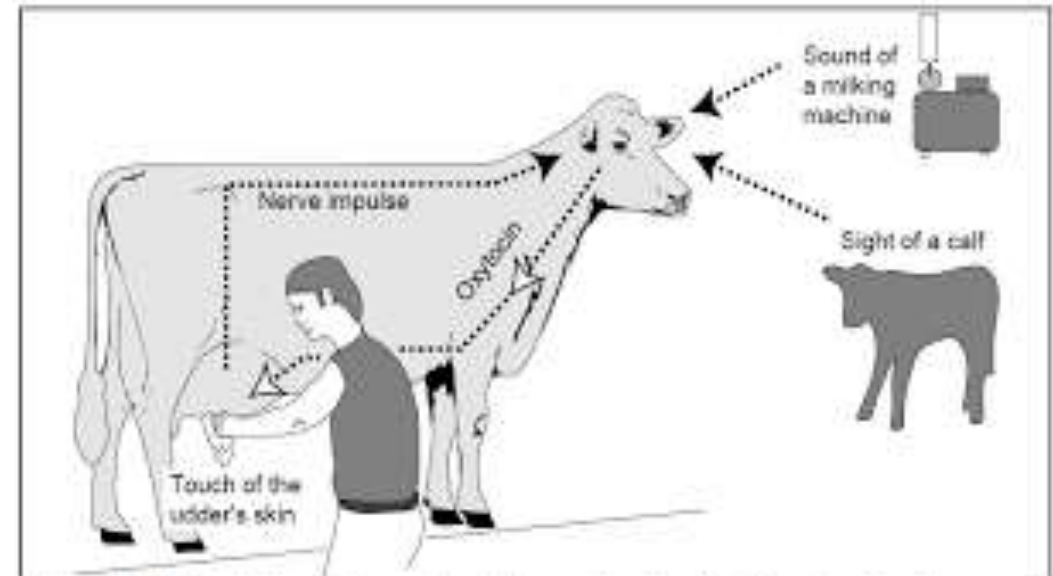
Gum boots are easy to clean.

## 17. Step 4: Clean teats and massage the udder

- Clean the teats and massage the udder with a dry towel or piece of paper.
- Only use water when the udder is really dirty and make sure it is dry before milking.
- Do this at least for 30 seconds so the cow will let-down the milk.
- Start milking after 30 seconds or within 1 minute.



Wet drops containing bacteria will run to the teat end.



- Massage of the udder, the sound of a milking machine or the presence of a calf promotes the release of oxytocin hormone, which causes a milk drop/let-down. It starts after a few seconds and the effect will last only for a few minutes, so it is important that the cow is milked quickly after stimulating.
- Sometimes, in case of very high yielding cattle (>20ltr) two milkers are milking one cow, each sitting on one side.



## 17.1 Udder towels

- When udders are clean, wiping with dry paper or a clean towel will do.
- Use one paper or one towel per cow to avoid cross contamination.
- Towels need to be washed and dried after each milking.
- When using wet towels, it is really necessary to put a disinfectant in the water.



Cleanable udder towels.



Examples of disposable paper towels

## 18. Step 5: Check the first milk

- This is done to check if the milk is normal; and because the first milk contain the most bacteria, if present.
- Take 3 spades of milk and check on:
  - Color
  - Consistency
  - Clots or flakes



To avoid cross contamination do not put it on the ground, but do it in a cup.

## 19. Step 6: Milk in the correct way

Good hand milk technique is crucial.

- When not doing it correctly the teat ends can be damaged.
- This increases the risk of mastitis.
- Field findings in the South West of Uganda indicate that a lot can be gained here.



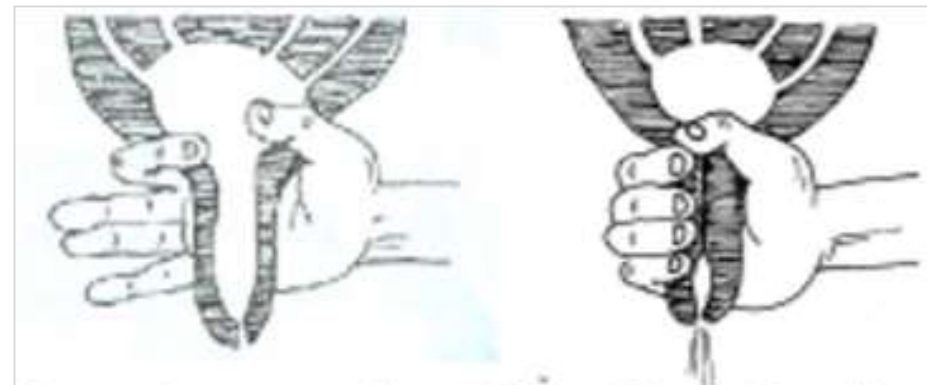
1. Grasp the teat with thumb and first finger



2. When closing the second and third finger milk will come out.



3. Close the little finger and squeeze the teat with the whole hand.



4. Then release the teat, it will fill with milk again. Then repeat steps 2, 3 and 4.

## 19.1 Stripping

One of the most common mistakes made in hand milking is called stripping.

- This can be painful for the cow.
- It increases the risk of damaging the teat openings.
- Remember there is no better milker than the calf.
- The milker should imitate her way of doing it.



Grasping the teat with thumb and first finger and then pulling them down is called stripping



Good



Bad

## 20. Machine milking

- With the number of milking machines increasing, the risk of mastitis will increase.
- Milk machines need proper maintenance.
  - Pulsation rate has to be correct.
  - Vacuum need to be well adjusted.
  - Liners need to be replaced regularly.
  - Good cleaning has to be performed after each milking.



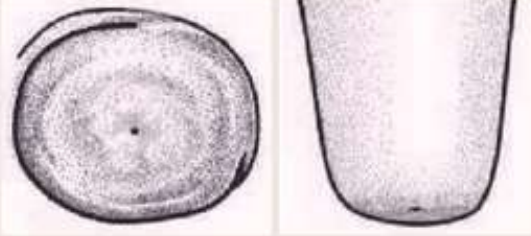

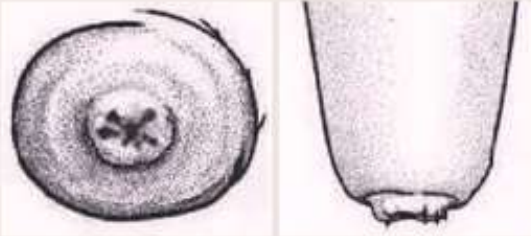
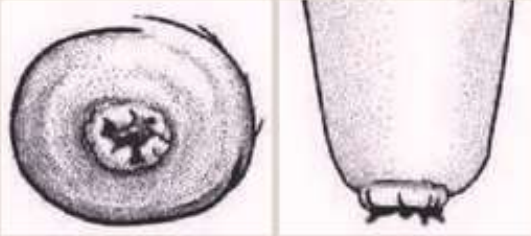
Machine milking



## 20.1 Machine milking Cont'd...

An indication about a correct way of milking can be obtained by doing a teat end score.

- Score 1 and 2 are considered to be normal.
- Score 3 and 4 are not wanted and indicate a higher risk for mastitis.
- When milking using a machine one should aim to have 80% of the cattle with scores 1 and 2.

Score	Description	Illustration
1	<b>No ring</b> The teat-end is smooth with a small, even orifice This is typical of many teats soon after the start of lactation	
2	<b>Smooth or slightly rough ring</b> A raised ring encircles the orifice The surface of the ring is smooth or it may feel slightly rough but no fronds of old keratin are evident	
3	<b>Rough ring</b> A raised, roughened ring with isolated fronds or mounds of old keratin extending 1-3 mm from the orifice	
4	<b>Very rough ring</b> A raised ring with rough fronds or mounds of old keratin extending 4 mm or more from the orifice The rim of the ring is rough and cracked, often giving the teat-end a 'flowered' appearance.	

## 21. Teat end score in pictures



**Score 1**

Smooth ring no callus



**Score 2**

Smooth callus ring



**Score 3**

Rough callus ring



**Score 4**

Very rough callus ring

## 22. Step 7: Dip teats

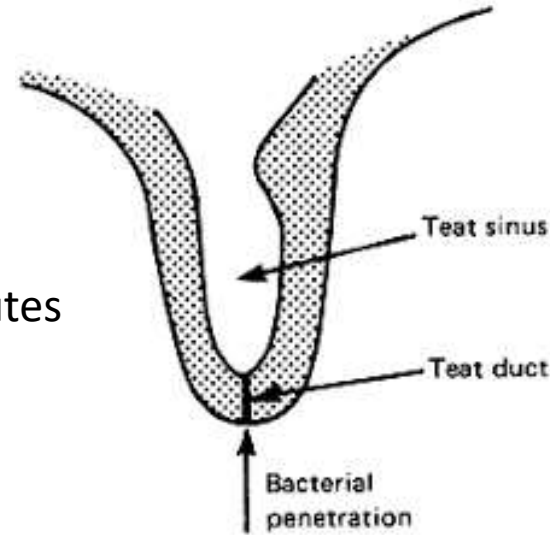
- After milking the teat hole stays open for another 30 minutes. During this time it is easy for bacteria to enter the teat canal and cause infection.
- It is highly therefore important that the hygiene during and after milking is optimal. In order to achieve this, the following actions can be implemented:
  - Sanitizing teats before milking,
  - Using gloves during milking,
  - Spraying/dipping the teats thoroughly immediately after milking,
  - Let the cows stand after milking so that the teats dry and close.





## 23. Step 8: **Keep cows standing after milking**

- It takes a while after milking before the teat openings close firmly.
- During this time the cow is vulnerable to getting mastitis infection.
- By letting the cow stand for at least 20 minutes after milking, this risk will be reduced.
- A good way to do this is by offering the cow feed immediately after milking.



## 24. Step 9: Filter the milk

- Filtering the milk is primarily done to get unwanted substances out of the milk like straw and flies.
- But by filtering the milk it will also show possible clots in the milk if by accident mastitis milk is put into the can.
- When using a filter of cotton, linen or nylon, make sure that it is properly washed and dried after each milking/filtering.



## 25. Step 10: Clean milk equipment

- Infections can spread by dirty towels, buckets and churns.
- The first aim of cleaning is to remove dirt.
- By removing dirt you remove majority of the bacteria as well.
- There is a difference between cleaning and disinfection (killing bacteria).
- You disinfect the equipment by putting the equipment in the sun and by drying it.
- For good cleaning several factors are important;
  - Mechanic (Brushing, weeping and rinsing)
  - The time it takes (The longer the better)
  - Dissolving the dirt (Using soap)
  - The temperature (The higher the better)
  - Disinfection (Drying, use of disinfectants)



### Cleaning protocol

- First remove most dirt mechanically
  - Rinse
  - Brush
- Clean & disinfect
  - Hot water
  - Disinfectant
  - Soap
- Rinse again
- Dry.



## 26. Treatment of mastitis

- The best treatment of mastitis is milking.
- Milk the cow as often as possible and milk her completely out.
- By milking you remove the dead tissues and bacteria.
- Also massage the udder, what stimulated the blood flow and milk.

Next to that;

- Antibiotic treatment will help.
- Use intra mammary tubes.

In severe cases (fever, not eating);

- Always check body temperature (should be below 39 degrees celcius).
- Call a vet.
- The vet can decide to give antibiotics by injection or anti inflammatory drugs.



## 26.1 Treatment of mastitis cont'd: Intra-mammary tubes

### i. Using intra-mammary tubes

- Mark the cow (so you know milk needs to be withdrawn).
- Clean the teats.
- Put on gloves.
- Milk affected quarter and disinfect the teat hole an the teat end (alcohol is a good disinfectant).
- Bring the short end of the injector in the teat hole and push the injector contents gently into the teat canal.
- Dip or spray the teats.



## 26.2 Treatment of mastitis cont'd: Dry-off

### ii. Dry-off treatment

- In the past this was done as a preventive treatment.
- In order to reduce the use of antibiotics (to prevent antibiotic resistance) nowadays, it is only recommended for cattle with sub-clinical mastitis.
- So check before drying off the somatic cell count with a Californian mastitis test.
- Treat with long term antibiotics.
- Or use a teat sealer (this can also done preventively).



Cow dried off with teat sealer.



#### The dry period:

- It is general custom to dry-off a cow 8 weeks before calving.
- This gives the udder time to recover and to be prepared for the next lactation.
- It is a fairy tale that cattle need to be dried off to get pregnant.