The Importance of Udder Hygiene
Mastitis is the name given to udder inflammation. Alongside a change in the milk characteristics, classical inflammation symptoms such as reddening, swelling, pain, a hot udder and even disturbance of general condition mean that clinical or acute mastitis is easily detected.

Far more difficult to recognise, because of the lack of external symptoms, but just as important for stock management, is the diagnosis of sub-clinical mastitis. This is because a cow which already has sub-clinical mastitis may easily develop clinical mastitis, e.g. if the immune system is weakened.

Here the use of targeted diagnostics helps to identify changes and reactions of the mammary gland. Increased cell counts or any pathogens detected point towards latent infection or unspecific mastitis. The following table shows how milk diagnostics or changes to the udder allow conclusions to be made:

<table>
<thead>
<tr>
<th>Milk cell count</th>
<th>Udder pathogens</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 100,000/ml</td>
<td>not evidenced</td>
</tr>
<tr>
<td></td>
<td>normal secretion</td>
</tr>
<tr>
<td>&gt; 100,000/ml</td>
<td>unspecific mastitis</td>
</tr>
</tbody>
</table>

*Mastitis diagnosis based on cytological and microbiological findings*
Systematic diagram illustrating the onset and healing of mastitis according to DVG 2002

If the cell count is analysed and assessed, both the lactation state and age of the animal must be considered. A cell count of 200,000/ml towards the end of lactation may well be regarded as normal for an older cow.

However if the same cell count were detected in a heifer at the beginning of lactation, it would indicate unspecific, or in the presence of pathogens, a clear case of mastitis.
Diagnosis by pathogen detection

If udder health is assessed using the evidence of pathogens, then microbiological investigation by udder quarter makes sense. For a reliable analysis, extreme care is required. Contamination of the sample by dirt and microbes from the udder skin or from the hands of the person taking the sample must be avoided at all costs.

The microbiological diagnosis requires a sample of milk taken under sterile conditions and milked into a sterile test tube.

The DVG procedure for reliable and successful analysis is described on the right:

- Pre-milking into a pre-milking cup

- Cleaning and disinfection of each teat, using one alcohol swab (70%) per teat for approx. 15 seconds
- Clean the furthest away teats first
- Where heavily soiled, clean and dry off the teats beforehand
- Person taking sample: Clean hands without any cuts or wearing gloves

- Take the first samples from the closest teats
- Do not open sterile sample test tubes until immediately before taking the sample and hold them horizontally
- If possible, fill the tube with a single squeeze, the teat must not come into contact with the test tube
- An examination must be carried out as quickly as possible, cooling or some method of preservation may be necessary
Factors leading to mastitis

Mastitis is a multiple-factor disease. This means that a number of factors contribute to the development of the disease and that their combined interactions favour its development. Dependent on how positive or negative the influence of these factors on the mammary gland is, the result may be mastitis.

There is interaction between the risk factors at
- the level of the udder quarter
- the animal level
- the stock level

The individual factors can be easily influenced in different ways

<table>
<thead>
<tr>
<th>Short term:</th>
<th>Medium to long-term:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hygiene measures can be</td>
<td>The genetic disposition (shape, position of teats and udder) can only be changed in</td>
</tr>
<tr>
<td>quickly and easily</td>
<td>the medium to long-term.</td>
</tr>
<tr>
<td>affected, the results are</td>
<td></td>
</tr>
<tr>
<td>quick and clearly</td>
<td></td>
</tr>
<tr>
<td>visible.</td>
<td></td>
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Lower the likelihood of infection through
optimised byre climate

Support the immune system of the herd
with optimum husbandry

Improve teat condition
Mastitis results from an interplay between:

- **Likelihood of infection**
  - Udder shape
  - Teat shape and position
  - Milking installation settings
  - Teat cup liners
  - Genetics
  - Weather, climate
  - Feeding
  - Genetics (susceptibility to mastitis)
  - Lactation state, yield level
  - Other diseases

- **Body defences (immune status)**
  - Cows suffering from mastitis
  - Stress
  - Birth

- **Factors**

The chart shows how important it is for stock management to optimise those factors affecting the stall over which one has an influence:

- **Lower the likelihood of infection**: Improve byre atmosphere and hygiene, if possible leave the animals standing in the feeder grill, clean the boxes during milking, segregate or move away infected animals.
- **Improve teat condition**: Use care products, check and optimise milking installation settings.
- **Support the herd immune status**: Avoid stress, optimise feeding and husbandry conditions, arrange groups, dry period, calving boxes, optimise climate.
- **Medium to long-term measures**: Improve breeding where there are deficits in the teat shape, number (superfluous teats) and udder shape (hanging, stepped udder), as well as for cows which are difficult to milk.
Hygiene measures: Reasons for cleaning and disinfection

A wide range of microbes finds ideal growing conditions wherever there is dirt and dust. Therefore, it is important that wherever food production takes place, appropriate hygiene requirements are applied. Even on apparently clean hands and surfaces a considerable number of microbes are seen to be present. Even if sterile housing of animals is not practical, it must be an objective to keep the amount of dirt as low as possible in the areas where the animals live.

Cleanliness is of great importance during milking. While the milk duct is open during milking, the udder’s natural barrier is not effective and gate and door are literally open to pathogens.

At this moment, even the milker is a potential carrier of all types of microbes: dirty hands or hands with cuts or cracks constitute a dangerous source of pathogens. During milking these are transmitted quickly from one cow to the next.
The wearing of gloves is sensible and necessary for this reason alone. On the one hand, the milker is protected and on the other, microbes and dirt cannot adhere to the smooth surface of the gloves. Even when wearing gloves regular cleaning and disinfection should not be omitted!

**Little microbial growth**
Fingerprint on agar from a glove protected hand.

Whatever is important for ensuring healthy clean milk and animal health, is equally important for the consumption of foodstuffs and our own health: Soiling of the milk produced by faeces is the most common cause of microbes in raw milk. This directly effects further processing and consumer health!

**Breeding ground**
Skin cracking or cuts increase the growth of microbes.

**Transmission**
Pathogens can be spread from cow to cow via the milker's hands.

**Protection**
Gloves protect against the growth of microbes on the milker's hands.
Udder measures

Shortening of the udder hair is an important prophylactic measure. Firstly adhesion of dirt is less likely, secondly udders which have been cleaned remain clean for longer. Shortening can be done by cutting or careful flame-scarfing and is particularly important in winter.

Clean udders deny entry to pathogens!

The following pictures illustrate the microbe loading on the teat after various cleansing measures have been undertaken.

Effective pre-cleaning significantly reduces colonization of the milk ducts and the udder with environment-related pathogens.

This denies entrance of the pathogens so that they cannot get into the udder during milking!

Microbe growth of a swab sample taken from the teat skin

... without cleaning  ... after cleaning with a dry udder cloth  ... after cleaning with a moist udder cloth  ... after wet cleaning

[Images of teats with microbe growth comparisons]
Prevention is better than cleaning: Housing and stalls

Cleanliness begins in the byre since heavy soiling of the udder is a consequence of inadequate housing conditions.

Thus it is necessary to check the situation in the byre and, by improving cleanliness, make life more difficult for any pathogens.

The condition and cleanliness of the udders is largely dependent on following factors:

- Type of byre
- Type of stalls
- Bedding material
- Number of stall
- Size and dimensions of the stalls
- Stall comfort

Of course, cows should be kept as clean and dry as possible.

Naturally this depends on the number and comfort of the stalls. If a new byre is being built or a byre is being converted, the size of the stalls must be matched to the size of an average herd member.

Correct stall size is the prerequisite for their acceptance.
Pre-milking: an important and legal requirement

At the beginning of milking, the first jets are particularly rich in microbes which, according to milk legislation, must be discarded. Many farmers regard this pre-milking as an additional workload. Actually it has a double purpose:

1. Firstly pre-milking helps the milking routine, that the contact acts to stimulate milk flow.

2. Secondly it enables assessment and diagnostic investigation of the milk: Milk which has changed significantly is recognised in time and does not enter the tank (no contamination through high cell and/or microbe counts). Examination of the pre-milk permits early diagnosis of diseases so that they can be treated immediately.

3. Thirdly, the use of the pre-milking cup:
The use of a pre-milking cup is absolutely essential for the prevention of the spread of pathogens within the milking parlor by so-called pathogen aerosols. In a manner similar to human sneezing, bacteria can be enclosed in a liquid (from spraying and cleaning of the parlor) and transported over great distances. This permits the pathogens to spread throughout the milking area and infect other animals.

A pre-milking cup, is excellent for assessing the consistency of the milk because of its shape and function.

On first contact with the teat there is a release of oxytocin, the hormone which is responsible for the milk being released through a contraction of the muscles in the alveoli. On the one hand the stimulus should be strong and of sufficient length while on the second hand cluster attachment should optimally take place 60 – 90 seconds after first contact and at the most no more than 2 minutes after first contact. As the effects of oxytocin only last for 4 – 8 minutes, speedy and optimum stripping is ensured.
Cleaning of the udder

EU legislation specifies that milk must be taken from clean udders. Cleaning must increase cleanliness and reduce the likelihood of infection. After cleaning the udder must be dry in order to prevent entry of previously released pathogens and riding-up of the cluster.

The duration of pre-cleaning should be considered bearing in mind its stimulation effect.

Udder cleaning procedures

1. **Dry cleaning with cloths**
   As a matter of principle only one cloth per cow should be used for dry cleaning to prevent the transmission of udder pathogens from one cow to another. Paper cloths (e.g. Dermacel or Sowotaan Udder paper) and textile cloths (Dermatex) are available.

   The multiple use of textile cloths requires that they are carefully cleaned and disinfected between milking sessions to ensure all microbes are killed. We recommend DomoWash PE for washing.

2. **Moist cleaning with cloths**
   Moist cleaning can be carried out using paper cloths (Sowotaan wet or Dermacel soaked in the special bucket). The addition of alcohol to moist cloths accelerates their drying as well as that of the teats.

   For damp cleaning we recommend that the cloths be soaked in DermaPre or LuxPre.
Wet cleaning of udders

Wet cleaning is necessary for heavily soiled udders and where there is a high likelihood of infection. This can significantly reduce the danger of infection through environment-related pathogens which would otherwise reach the udder due to back-spray during milking.

The use of udder cleaners or pre-dip agents requires that the teat is dried off. This ensures that no residues from cleaners or disinfectants can enter the milk. Pre-dipping is permitted in some countries. National regulations partially restrict this.

### Recommendations for procedure and products to be used prior to milking

Based on the udder hygiene status classification

<table>
<thead>
<tr>
<th>Result of the udder scoring</th>
<th>Procedure</th>
<th>Product</th>
<th>Time (sec.)</th>
<th>Microbe loading before cleaning</th>
<th>Microbe loading after cleaning</th>
</tr>
</thead>
</table>
| > 80% of the herd 1         | Dry cleaning    | • Sowotaan  
• Dermatex  
• Dermacel | 17 | Dirty teat  
Dry cleaning  | Dirty teat  
Dry cleaning |
| > 80% of the herd 1 and 2   | Moist cleaning  | • Sowotaan wet or  
• Dermacel in LuxPré,  
SensoPré or DermaPré soaked | 17 | Dirty teat  
Moist cleaning  | Dirty teat  
Moist cleaning |
| > 30% of the herd 2 and higher | Wet cleaning | • DermaPré F and subsequent drying off | 24 | Dirty teat  
Wet cleaning  | Dirty teat  
Wet cleaning |

If over 15% of the herd have results which come in the range 3 to 4 a problem evaluation should be undertaken and an appropriate solution strategy found.

This provides a plan for the thorough cleaning of the majority of animals in a herd. Individual animals with heavier soiling must be cleaned in accordance with their level of soiling.
Importance of dipping

The period after milking is the time in which there is a particularly high risk of infection. This is when it is particularly worthwhile to care for udders which are severely stressed during milk extraction.

Because the teat’s milk duct closes 30 – 60 minutes after milking, the mammary gland is especially prone to infection after removal of the physical barrier following the milking phase. Feeding and watering the animals during this period is a suitable way for limiting contact with environmental microbes.

During milking the skin and the teat are placed under a certain amount of strain, depending on the equipment used and its settings. The milk duct is at times stretched lengthways by over 30% during milking while the increase in width is between 15 and 35%. This happens at least twice a day on approx. 305 days per year! For this reason attention should be paid to the following points which are critical for the maintenance of healthy teats:

1. **Tissue loading** both due to the milking force and of the length of milking can be minimized by a good layout and set-up of the equipment. This involves adjustment of the following parameters:
   - vacuum
   - set-up
   - pulsation
   - automatic stripping
   - shape of the teat cup liners
   The condition of the equipment must also be checked on a regular basis.

2. The teat skin is cared for and protected from penetration by pathogens through **careful selection** of the dipping agent used. This is achieved by stimulating the skins’ own defences and by the disinfectant component content.

   Lower tissue loading thanks to exact fitting of the teat cup liner
The method: spray or dip?

Many dipping agents can be sprayed or dipped. The disinfectant components in the agents are essentially the same. Unfortunately farmers who prefer spraying have to accept a few restrictions: A decisive disadvantage of spraying is the danger of spray shadows. Although on the one hand, application appears easier, on the other hand it requires more care in its application to achieve sufficient wetting of all teats (according to the National Mastitis Council, both dipping and spraying are acceptable, as long as it is ensured that the product is carefully applied).

Features such as non-drip or low-drip dipping agents, stronger care properties or a barrier function can only be achieved using dipping agents. Their greater viscosity makes spraying using these agents highly difficult.

Essential pre-conditions for the use of a dipping agent which is capable of being sprayed are:

- A careful application must be guaranteed
- Already good teat condition

Essential recommendations for the use of a dippable product are:

- Dry teat skin
- Marked hyperkeratosis or lower level hyperkeratosis among a large number of animals (the fraction and composition of the care components may have a positive effect on the development of hyperkeratosis)
Reasons for intermediate cluster disinfection

The transmission of cow-related pathogens (Staphylococcus aureus, Streptococcus agalactiae) takes place during milking. This can be avoided if personnel maintain hygiene measures during milking. Wearing of gloves is the first step and these should also be cleaned and, if necessary, disinfected during milking.

In herds with problems arising from cow-related pathogens, introduction of a milking sequence is recommended: First the heifers and animals which have just started milking, finally any infected animals. Alternatively, these can be milked using a separate cluster.

Milking phase
in the BackFlush system

Depending on the size of herd and milking parlour, the same milking cluster may well be used 10 times or more during a milking session. Therefore, microbe transmission from one cow to another can occur easily. This scenario is multiplied during subsequent milking sessions: pathogens from already infected animals are transmitted onwards to the rest of the stock!

Disinfection phase
in the BackFlush system

Therefore, intermediate disinfection of the milking clusters is particularly important on farms with a problem, e.g. Staphylococcus aureus. As microbes are continuously released by chronically infected cows, repeated transmission to other cows is possible.

Repeated microbe transmission can only be successfully treated by intermediate disinfection of the milking clusters.
# Procedure for intermediate cluster disinfection

The methods used are dependent on the farm and the shape of the milking parlour:

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immersion in a bucket</td>
<td>• No additional equipment required</td>
<td>• Requires careful and slow immersion; only two teat cups can be immersed at any one time in order to ensure complete wetting.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Changing of the solution during a milking session may, under certain circumstances, be necessary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Requires time and effort</td>
</tr>
<tr>
<td>Immersion tubs (towing method)</td>
<td>• No additional workload or time required</td>
<td>• Complete wetting of all teat cups is not completely guaranteed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Contamination of the solution</td>
</tr>
<tr>
<td>BackFlush system</td>
<td>• Automatic rinsing and disinfection</td>
<td>• Additional installation fixtures required</td>
</tr>
<tr>
<td></td>
<td>• Complete cleaning and disinfection guaranteed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Milk is not contaminated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No additional workload or time required</td>
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</tr>
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All methods use the same agent: Peracetic acid in products such as CircoFlush PE5 with a working concentration of 1.5 – 2%.

CircoFlush PE 15N is used in BackFlush systems with a concentration of 0.5 – 0.7%. This ensures quick and careful disinfection, with no disinfectant residues being let behind.

Alongside the routine implementation of cleaning and disinfection of the installation, the cluster holders should also be cleaned and disinfected at regular intervals in order to prevent the breeding and spreading of microbes. We recommend our range of manual cleaners, for example AgroClair AFM.
A well-suited byre climate and sound hygiene measures promote healthy teats and improves the udder immune system as well as the general well being of the animals. That means a stronger immune system reaction when the animal comes into contact with pathogens.

GEA Farm Technologies has a wide range of products to provide effective prevention against the spreading of mastitis pathogens. Special dipping agents and disinfection agents for the cluster protect the animals and promote health, so that the animals have a long economic life.

Animal-friendly and economical methods from GEA Farm Technologies:

We ensure that the farmer can obtain quality milk in the shortest possible time!
GEA Farm Technologies offers a "comprehensive carefree package":

- Milking parlours designed to be animal-friendly, stress-free and easy-to-use
- Optimum products for milking preparation and completion after milking
- Well thought-out installation cleaning and hygiene
Most important for stall comfort is the floor, which should be soft and insulating, together with the type of bedding used:

- Straw mattresses have the advantage that they provide a soft floor. However, their cleaning is difficult and involved. As straw is an organic material, straw mattresses must be assessed critically from a hygiene point of view.

- Rubber mattresses should provide insulation, while they also protect exposed body areas and limbs against rubbing. Their length should be chosen so that urine and faeces land behind the animal and do not soil the area where the animal lies.

- The use of organic bedding either in stalls or raised stalls with mattresses is problematic. Even if the bedding is produced in hygienically perfect conditions, pathogens can grow exponentially on it.

Just as it should be:

Stall comfort, soft and insulating with bedding that does not irritate the animal (particularly the udder skin!), creates little dust and absorbs a large amount of water.
GEA Farm Technologies
The right choice.