# Mastitis in lactating dairy cows – choosing the right intramammary treatment

We all know that mastitis represents one of, if not the most, significant problems in dairy herds worldwide. Preventing mastitis from occurring in the first place is paramount. Barn management, animal hygiene, genetics, milking systems, milking parlour hygiene, feeding, drying off protocols, herd record keeping and, in certain cases, vaccination all play an important part in prevention protocols on modern day dairy farms.

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Despite these prevention schemes being put in action and followed to the letter, mastitis still occurs during lactation and needs to be treated.

Apart from the fact that there are alternatives emerging, antimicrobials still represent the only approved treatment tools. Antimicrobials have been with us for a long time.

Since their humble beginnings in the early 20th century, antibiotics have been developed and diversified in so many ways.

Today, we have plenty to choose from and this is where the problems start. Not all antibiotics can be (and are) used for the treatment of mastitis in dairy cows.

There is a lot to consider when making a decision on which antimicrobial, or which combination of antimicrobial substances to use in a particular case or on a particular farm.

Moreover, mastitis can be treated with antibiotics applied by intramammary infusion, parenteral application, or with the combination of both, not forgetting supporting therapy, of course.

Here we will consider some of the boxes that need to be checked in the decision-making process.

## Pathogens

Which nemesis are you facing? This question will determine how a pathogen will be approached in treatment. There are more than 200 different organisms that can cause mastitis listed in scientific literature.

These are generally divided into environmental and contagious groups, although recent studies show that this distinction is not altogether clearly defined, since strains within the same species can act differently.

Moreover, the treatment of bacteria, which are the most common agents causing bovine mastitis will depend on whether they belong to a G+ or G- group.

Gram-negative (G-) bacteria are generally more resistant to antibiotics compared to Gram-positive (G+) ones. This is due to their distinctive envelope structure. G- bacteria have three layers: outer membrane, peptidoglycan cell wall and inner membrane.

It is the outer membrane which Gram-positive bacteria do not possess, making them more susceptible to antibiotics.

This is why treatment strategies can be different. For example, mild cases of E. coli (G-, environmentally predominant agent) can be resolved without antibiotics (anti-inflammatory treatment, frequent milking and fluid therapy), while cases of S. aureus (G+, predominantly bacteria causing contagious mastitis), primarily due to its residing places within the udder, require more and more prolonged use of intramammary antibiotics, or culling of the infected animal if it is for the better of the herds health.

## Antibiotic activity and resistance

Is a pathogen antibiotic resistant or susceptible? This information is of utmost importance, although sometimes not readily available. All treatments should be performed upon receiving antibacterial susceptibility test results.

In practice, this takes time, and because mastitis cases often require a prompt response, the use of broad spectrum antibiotics is advised, at least as a first response treatment. Keeping up to date with on farm treatment protocols is a must. This will show the frequency, effectiveness

*Continued on page 12*

*Continued from page 11*
and group of antibiotics to use, or to switch to, to avoid cross-resistance cases.

Due to the fact that the vast majority of available intramammary products contain either a single β-lactam antibiotic, or at least one β-lactam component, uncontrolled overuse can lead to the development of resistance to different members of this antibiotic group. Rotation with members of other groups of antibiotics, without compromising effectiveness or resistance development, should be part of a treatment protocol on any farm.

## Country specific guidelines

Pressure on decreasing the amount of antibiotics used in animals in general, especially livestock, is growing all over the world, backed up by the emergence of resistant bacterial strains both in animals and humans. This has greatly contributed to many countries creating and implementing strategies to reduce antibiotic use.

The European Medicines Agency for example, has categorised antibiotics for use in animals in four categories to regulate their use: A (Avoid), B (Restrict), C (Caution), and D (Prudence). According to these guidelines, many European countries have developed specific protocols for antibiotic treatment of mastitis cases, prescribing the first line of products to be used in any case of mastitis. The purpose of these regulations is to lower the use of antibiotics, contain resistance development and contribute to the 'one health' approach.

## Pharmacokinetics and Pharmacodynamics

Pharmacokinetics (PK) explores the interaction between an organism and a substance administered throughout exposure. There are four areas in which pharmacokinetics explores: absorption, distribution, metabolism and excretion (ADME). Pharmacodynamics (PD), on the other hand, looks into the molecular, biochemical and physiologic effects or actions which the drug produces in the organism.

The distribution of an antibiotic applied for the treatment of mastitis (intramammarily as well as systemically) will greatly depend on its PK/PD ability to overcome a very challenging udder environment and reach target pathogens. Ideally, an antibiotic should possess high lipid solubility, ionisation capability and the ability to avoid binding to serum or udder proteins.

Additionally, the type of carrier used in the formulation should facilitate uniform distribution. Weak bases such as tylosin base (Pharmasin 200 Solution for Injection from Huvepharma) are known to possess these characteristics and this is why it is one of the few molecules indicated for the treatment of mastitis parenterally.

## Duration of treatment

How long an intramammary antibiotic is applied for and how long the withdrawal time for milk is after the last application determines how long an animal will be out of production. This is also referred to as the 'time to milk'.

Albiotic intramammary solution from Huvepharma presents a different approach to intramammary treatment in many ways. The active substances in Albiotic (lincomycin and neomycin) do not belong to the β-lactam group of antibiotics, thus avoiding cross resistance with them.

The synergistic effect of these active substances makes it very effective in cases of S aureus infections. Albiotic is a solution rather than a suspension (usually present in marketable products) allowing easier administration into an inflamed udder. It does not contain any corticosteroids, allowing flexibility in the choice of anti-inflammatory agents and has a 'time to milk' duration of only 4.5 days. ■

**References are available from the author on request**