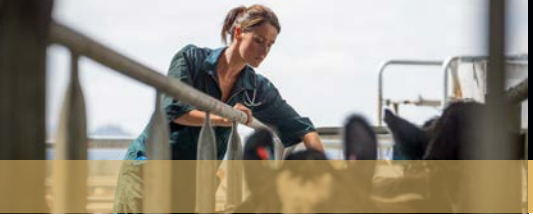
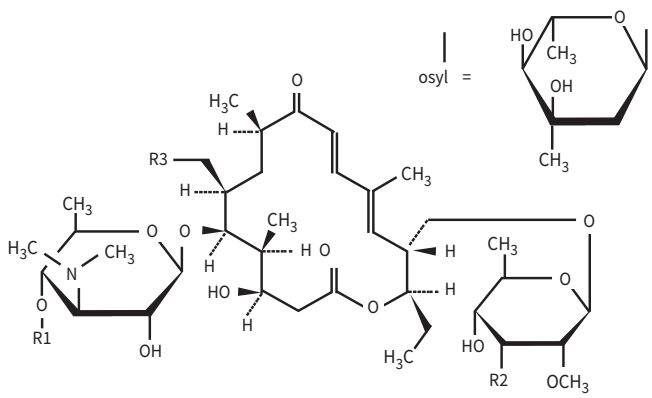


TYLOVET INJECTION – HIGH QUALITY TYLOSIN INJECTION

Introduction

TyloVet Injection contains 200mg/mL tylosin (as tylosin base) in a solution for injection. Tylosin is a mixture of four macrolide antibiotics produced by Streptomyces fradiae.
The four tylosin factors are very similar compounds (there are only minor changes in three areas of the chemical structure). The factors are Tylosin A, B, C, and D.

MOLECULAR STRUCTURE



Name	Mol. Formula	R1	R2	R3
Tylosin A	C46 H77 NO17	osyl	OCH3	CHO
Tylosin B	C39 H65 NO14	H	OCH3	CHO
Tylosin C	C45 H75 NO17	osyl	OH	CHO
Tylosin D	C45 H79 NO17	osyl	OCH3	CH2OH

Figure 1. Chemical structure of tylosin

The various tylosin factors have different antibiotic potency, with tylosin A being the most potent, as outlined below.

Factor	Specification for Tylosin	Relative Antibiotic Potency
Tylosin A	> 80%	1.00
Tylosin B	Sum of all tylosin	0.83
Tylosin C	A + B +C + D	0.75
Tylosin D	≥95%	0.35

Figure 2. Tylosin factors in tylosin base

The European Pharmacopoeia specifications for tylosin for veterinary use lists a minimum tylosin A content of 80% and minimum for the combined sum of tylosins A, B, C and D of 95%. Maximising the tylosin A content optimises antibiotic potency of the finished product.

Quality Manufacturing

TyloVet Injection is manufactured in Europe to stringent quality guidelines. The manufacturer of TyloVet Injection is Europe's largest manufacturer of tylosin. The company are experts in fermentation, which is the process required to manufacture this active ingredient. The result is a product of highest quality which consistently exceeds pharmacopoeial specifications for tylosin activity and purity.

Product Testing

There are three tylosin base, and one tylosin tartrate, injectable products available in New Zealand. Samples of each of these products were recently tested for their tylosin content by an accredited laboratory experienced in this assay method.

COMPARISON OF TYLOSIN INJECTABLE PRODUCTS

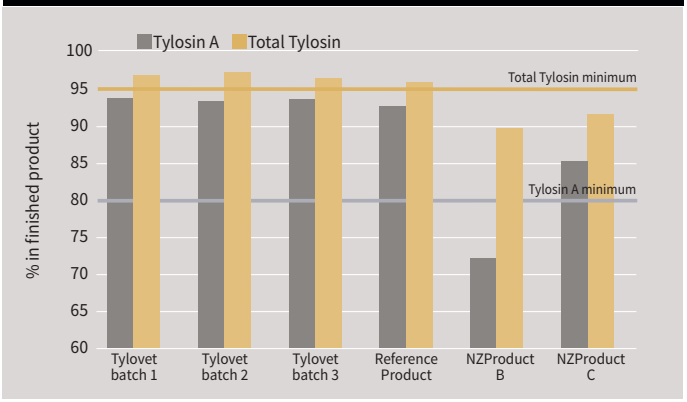


Figure 3. Comparison of New Zealand tylosin injectable products

The results (refer Figure 3) show that TyloVet Injection consistently has ≥ 90% tylosin A and > 95% total tylosin factors. This compared favourably with the NZ reference (tylosin base) product. The other tylosin injectable products available in NZ tested lower; with one below both of the minimum specifications for tylosin, and the other under the minimum specification for the sum of the tylosin factors.

Using Tylosin Injection for Mastitis

1. Pharmacokinetic considerations

Tylosin is lipid soluble and is a weak base. Milk has a high fat content and pH of around 6.7 so tylosin easily moves into the lipophilic environment where it becomes ionised. This ionisation traps the tylosin within the milk compartment. Tylosin concentrations in milk can be 20 times plasma concentration (Gingerich et al).

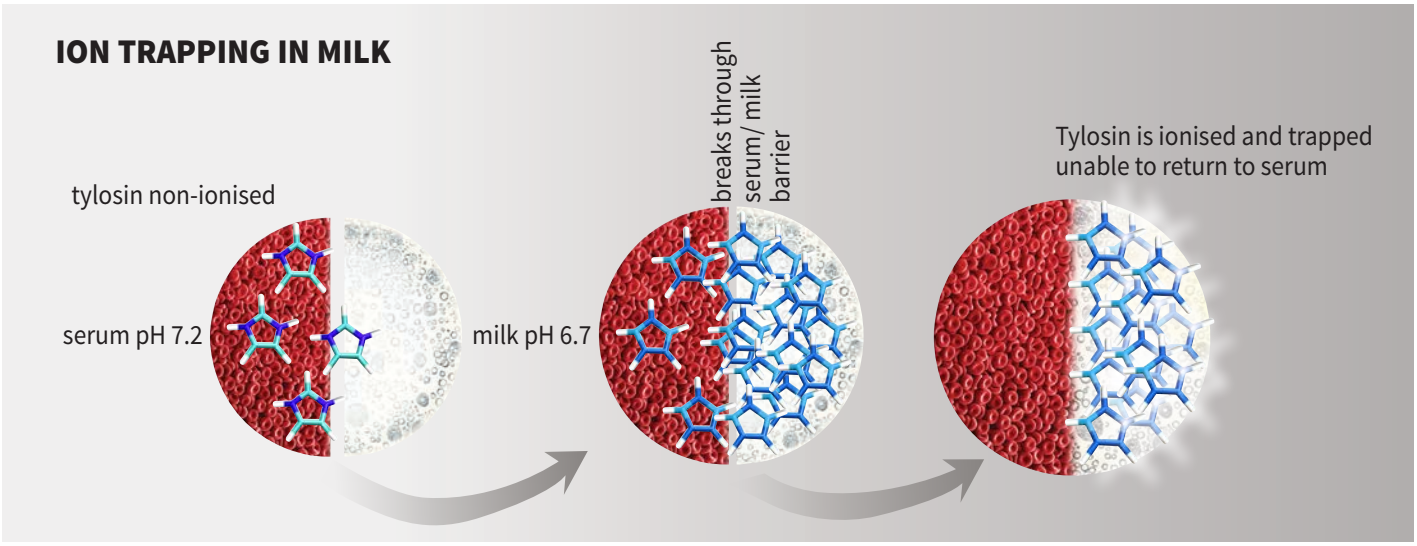


Figure 4. Ion trapping of tylosin

As a weak base, tylosin also becomes "ion-trapped" within macrophage cells. The inside of macrophage cells are acidic so tylosin within these cells becomes ionised and is then trapped within the cells. This means that tylosin is in high concentrations at the site of "action" in mastitis – within the macrophages that are key players in the immune response to foreign invaders of the body, such as infectious microorganisms. Hence, macrophage cells (with associated tylosin) are found in high numbers at the site of infection.

2. Tylosin tartrate vs tylosin base

Tylosin tartrate is water soluble so this tylosin form is typically used for in-water medication of monogastric animals, such as pigs and poultry. The degree of lipid solubility for injectable mastitis treatments is important in the ability of an active ingredient to cross the blood – milk barrier. Lipophilic drugs such as tylosin base cross easily, whereas water soluble drugs do not cross so freely.

3. Pharmacodynamic considerations

Tylosin is a macrolide antibiotic that is active against most aerobic and anaerobic gram-positive bacteria. It is indicated for the treatment of streptococcal and staphylococcal infections.

New Zealand trial work demonstrated bacteriological cure rates of 83.8% for tylosin base when used in early season mastitis cases in dairy cattle (McDougall et al, 2007). This cure rate is similar to that reported for other mastitis treatment regimes, so tylosin is an antibiotic of choice for the treatment of mastitis.

4. Practical considerations

In New Zealand dairy cows, it is common for more than one quarter to be infected when a cow has mastitis. McDougall (1998), reported in one NZ study that over 85% of cows had more than one quarter with mastitis (clinical and subclinical), and 23.2% had more than one quarter with clinical mastitis. Using tylosin to treat mastitis means all quarters of the udder will be targeted.

Systemic treatment using TyloVet Injection means mastitis cases in non-targeted quarters are treated early, often before becoming problematic clinical cases.

Summary

TyloVet Injection is a high quality, tylosin base solution, ideally suited as an antibiotic to treat mastitis in cattle.

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