Mansoura University
Faculty of Veterinary Medicine
Department of Pharmacology

Some pharmacological studies on spiramycin in bovine mastitis

A Thesis Presented By

Marwa Mohamed Samir Barakat Hamed

(B.V.Sc., Mansoura University, 2011)

(M.V.Sc, Pharmacology, Mansoura University, 2016)

Faculty of Veterinary Medicine, Mansoura University

Under Supervision of

Prof. Dr. Mohamed Gabr El-Sayed Gabr

Professor of Pharmacology

Vice Dean for Community Service and Environmental Development

Faculty of Veterinary Medicine - Mansoura University

Dr. Mohamed Mosbah El-Diasty

Senior Researcher of Bacteriology

Animal Health Research Institute Mansoura Provincial Lab

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List of contents

List of abbreviation

ALB	Albumin
ALP	Alkaline phophatase
ALT	Alanine aminotransferase
AST	Aspartate aminotransferase
BHI	Brain heart infusion
CM	Clinical mastitis
CMT	Clifornia mastitis test
CNS	Coagulase-negative Staph
DCT	Dry cow therapy
GLP	Globulin
GOT	Glutamic oxaloacetic transaminase
GPC	Gram positive card
GPT	Glutamic pyruvate transaminase
Hp	Haptoglobin
IM	Intramuscular injection
IMI	Intramammary infection
IMM	Intramammary injection
IV	Intravenous injection
MCHC	Mean corpuscular heamoglobin concentration
MCV	Mean corpuscular volume
MIC	Minimal inhibitory concentration
MRLs	Maximum residual limits
PCV	Packed cell volume
SAA	Serum amyloid A
SCC	Somatic cell count
SCM	Subclinical mastitis
SPM	Spiramycin
TEC	Total erythrocytic count
TLC	Total leucocytic count
TP	Total protein

List of tables

List of figures

Summary

In our study, we evaluated the bacteriological findings before dry therapy were very high as *Staphylococcus aureus* was the most common bacteria in examined groups as it was isolated from 31 cows, followed by *Streptococcus* spp. as it was isolated from 30 cows then *E. coli* isolated from 23 cows while coagulase negative staphylococci could be detected in 9 cows.

The non lactating (dry) phase of the dairy cow is specific period between active lactating phases when the mammary gland changes dynamically both in structure and function. During dry period, elimination of infection is more likely than during lactation as the drug is not milked out and higher and more uniform concentration of antibiotic is maintained in the udder in addition there are no economical losses due to discarding of antibiotic in milk.

This study found that there was a difference between the four different dry cow treatments (DCT) and their effectiveness in reducing intramammary infections (IMI). First three treatments were applied during dry period only to eliminate microbial population causing mastitis such as *Staphylococcus* spp. and *Streptococcus* spp.

Dry cow therapy continues to lower significantly the rate of new dry period intramammary infection in herds with elevated somatic cell counts and a high prevalence of infection.

The most effective treatment was applied in group 4 which showed decrease in infection rate, decrease in occurrence of clinical mastitis next lactating season, increased in milk production and this point is important from the economic view of dairy farms. This increase in milk production is due to decrease of infection rateand decrease of clinical mastitis which lead to improve udder tissue thus increasing its ability to produce milk.

On the basis of these finding, spiramycin is indicated for the treatment of gram positive bacteria especially *staph. aureus* in subclinical mastitic cows at dry period as shown in our results in 1st , 3rd and 4th group. Spiramycin remain effective against staph. Aureus by inducing rapid breakdown of polyribosomes, an effect which has formerly

been interpreted as occurring by normal ribosomal run-off followed by an antibiotic–induced block at or shortly after initiation of a new peptide,

Comparing to the different regiems of dry cow therapy in our study reflect to us that the lowest results for cure rate and level of milk production moreover the appearance of new infected quarters for the same treated cows in next milking season were in the first group which treated with spiramycin only as two injection, 24 hours interval due to that the level of spiramycin in the milk was 125, 111.6, 68.2 and 25.2 in 4, 7, 14 and 21 respectivelly in mastitic cows and these level are under the MIC of staph. aureus (>32 mg/L) and strept spp. (0.125- 1 mg/ml). So spiramycin be more effective in first 6-24 hrs, however spiramycin injection has synergistic effect with ceftifure as intramammry to obtain more recovery rate, more milk production and sure less new clinical cases in the next milking season.

Spiramycin at this high concentration act as bactericidal so it has a synergistic effect with ceftiofur which inhibit the formation of the cell wall of the bacteria, therefore, the most recovered animal and more increasing in the milk production in the 3rd and 4th group**.**

The effect of spiramycin at 30,000 IU/kg b.w by I.M. injection on total erythrocytic count, hemoglobin and platelets in healthy and mastitic cows:

Mastitic treated group with spiramycin at dose 30,000 IU/kg b.w. show significant decrease in total erythrocytic count and hemoglobin at zero day after treatment also, the same results were recorded at 3 and 7 days after treatment while healthy treated group with spiramycin at dose 30,000 IU/kg b.w. show significant increase in total erythrocytic count and hemoglobin at zero day after treatment also, the same results were recorded at 3 and 7 days after treatment for RBCs only

our results showed a significant increase in platelets count at zero day after treatment while at 3 days after treatment and 7 days after treatment in mastitic treated group it showed a significant decrease. Healthy treated group show significant decrease after treatment.

The effect of spiramycin at 30,000 IU/kg b.w by I.M. injection on White Blood Cells in healthy and mastitic cows:

Our data revealed a significant increase in total leukocytic count and neutrophils at zero and 3 days after treatment of mastitic group. Also, the healthy treated group showed a significant increase only at 3 days after treatment in total leukocytic count.

The present results showed a significant decrease in lymphocyte at zero day after treatment also, the same results were recorded at 3 and 7 days after treatment with spiramycin at dose 30,000 IU/kg b.w. in mastitic group. Our results detected Results evaluated a significant increase in eosinophils at zero, 3 and 7 days after treatment with spiramycin at dose 30,000 IU/kg b.w. in mastitic group. Healthy treated group with spiramycin at dose 30,000 IU/kg b.w. showed a significant decrease in eosinophils only at zero day after treatment. Also there is a significant decrease in basophils in both healthy treated and mastitic treated groups with spiramycin at dose 30,000 IU/kg b.w. at zero day after treatment and also, at 3 days after treatment. Results detected a non-significant changes in monocytes.

The effect of spiramycin at 30,000 IU/kg b.w by I.M. injection on alanine transaminase (ALT), aspartate transaminase (AST) and alkaline phosphatase (ALP) in healthy and mastitic cows:

Our results showed a significant increase in (ALT) at zero day, 3 days and 7 days after treatment with spiramycin at dose 30,000 IU/kg b.w. in mastitic group while in healthy treated group ,(ALT) showed a significant increase after 3 days of treatment. Also the results revealed a significant increase in (AST) and (ALP) in both groups treated with spiramycin at dose 30,000 IU/kg b.w. at zero, 3 days and 7 days after treatment

The effect of spiramycin at 30,000 IU/kg b.w by I.M. injection on total protein, albumin and globulin in healthy and mastitic cows:

The study reflected a significant increase in total protein after 3 days after treatment in mastitic treated group and albumin showed a significant increase at zero, 3 days and 7 days after treatment in both groups while globulin reflected no significant changes.

The effect of spiramycin at 30,000 IU/kg b.w by I.M. injection on immunoglobulin G (IgG) in healthy and mastitic cows:

Our results showed a significant increase in immunoglobulin G (IgG) at zero day, 3 and 7 days after treatment in mastitic group. Healthy treated group showed a significant increase at zero day after treatment.

The effect of spiramycin at 30,000 IU/kg b.w by I.M. injection on amyloid A and haptoglobin in healthy and mastitic cows:

There is a significant increase on amyloid A at zero, 3 days and 7 days after treatment in mastitic group while healthy treated showed a significant decrease only at zero day after treatment. Haptoglobin also showed a significant increase at zero, 3 and 7 days after treatment in mastitic treated group while healthy treated showed a significant increase at zero day and 7 days after treatment with no significant changes after 3 days of treatment.

Residue of spiramycin on milk of healthy treated and mastitic treated cows:

Veterinary drug residues in milk remain a paramount concern to farmers, processors, milk regulatory agencies, and consumers because milk is widely consumed by people of all ages. Veterinary drugs are broadly used to treat several cattle diseases or increase milk production. Consequently, drug residues are accumulated and secreted alongside milk. However, before consumption, a majority of animal products undergo thermal treatment that leads to water loss, fat degradation, and protein denaturation, as well as an altered pH, which helps change drug residue quantity and chemical structure and, hence, the pharmacological and toxicological effects**.**

These residues can cause significant public health hazards such as hypersensitivity reactions, cancer, mutagenicity, reproduction challenges, bacterial resistance, and disruption of intestinal normal flora. Therefore, it is the responsibility of veterinarians and livestock producers to observe the relevant drug withdrawal period before animal slaughter and ensure that undesirable residues do not accumulate in edible products. Veterinarians should be updated with the latest information, to create awareness among producers and employees, as well as the general public. Moreover, avoiding unapproved

or illegal drugs and practicing proper drug use and best farm and livestock management can lead to the control of drug residues.

The residue of spiramycin in the milk of healthy and mastitic cows; there is a significant increase in mastitic treated cows compared to healthy treated cows at 4 days, 7 days, 14 days and 21 days post treatment by spiramycin, but the two groups still under the maximum residue limits (MRLs) at the 4^{th} day (12 milking) (120 ng/ml and 125 ng/ml in healthy and diseased group respectively). The European Union has established maximum residue limits (MRLs) for most of the veterinary drugs used in food-producing animals. The limit for spiramycin in milk is 150-200 µg/kg.

So we conclude from our experiment that spiramycin can be used in treatment of mastitis in dairy cattle at its recommended dose 30,000 IU/kg b.w by I.M. injection for two days and its MRLs after 12 milking.