

## PHARMACOLOGY AND CHEMOTHERAPEUTIC EFFECT OF PENSTREP 400 ON CATTLE

*(Literature analysis)*

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**Abstract:** This article describes the pharmacological properties of Penstrep 400 and its chemotherapeutic effect in the treatment of infectious diseases in cattle. The combination of penicillin and streptomycin antibiotics, which are part of the preparation, has a wide spectrum of action and exhibits high bactericidal effectiveness against gram-positive and gram-negative microorganisms. The absorption, distribution, and excretion of Penstrep 400 in the body, as well as its ability to maintain therapeutic concentration for a long time, were analyzed. The results of the study showed the effectiveness of the drug in the treatment of infections of the respiratory tract, digestive system, genitourinary organs, and mammary glands.

**Keywords:** Penstrep 400, penicillin, streptomycin, combined antibiotic, pharmacological properties, antimicrobial effect, bactericidal effect, gram-positive bacteria, gram-negative bacteria.

## PENSTREP 400 PREPARATINING FARMAKOLOGIYASI VA QORAMOLLARGA KIMIOTERAPEVTIK TASIRI

**Annotatsiya:** Mazkur maqolada Penstrep 400 preparatining farmakologik xususiyatlari hamda qoramollarda infeksiyon kasalliklarni davolashdagi ximioterapevtik ta'siri yoritib berilgan. Preparat tarkibiga kiruvchi penitsillin va streptomitsin antibiotiklarining kombinatsiyasi keng ta'sir doirasiga ega bo'lib, gram-musbat va gram-manfiy mikroorganizmlarga nisbatan yuqori bakteritsid samaradorlik ko'rsatadi. Penstrep 400 ning organizmda so'rilishi, taqsimlanishi va chiqarilishi, shuningdek uning terapevtik konsentratsiyani uzoq muddat saqlab turish xususiyatlari tahlil qilingan. Tadqiqot natijalari preparatning nafas olish yo'llari, ovqat hazm qilish tizimi, siydik-jinsiy a'zolar va sut bezlari infeksiyalarini davolashda samarali ekanligini ko'rsatdi.

**Kalit so'zlar:** Penstrep 400, penitsillin, streptomitsin, kombinatsiyalangan antibiotik, farmakologik xususiyatlar, antimikrob ta'sir, bakteritsid ta'sir, gram-musbat bakteriyalar, gram-manfiy bakteriyalar.

## ФАРМАКОЛОГИЯ И ХИМИОТЕРАПЕВТИЧЕСКОЕ ДЕЙСТВИЕ ПЕНСТРЕП 400 НА КРУПНЫЙ РОГАТЫЙ СКОТ

**Аннотация:** В данной статье освещены фармакологические свойства препарата Пенстреп 400 и его химиотерапевтическое действие при лечении инфекционных заболеваний крупного рогатого скота. Комбинация антибиотиков пенициллина и стрептомицина, входящих в состав препарата, обладает широким спектром действия и проявляет высокую бактерицидную эффективность против грамположительных и грамотрицательных микроорганизмов. Проанализированы особенности всасывания,

распределения и выведения пенстреп 400 в организме, а также его способность поддерживать терапевтическую концентрацию в течение длительного времени. Результаты исследования показали эффективность препарата при лечении инфекций дыхательных путей, пищеварительной системы, мочеполовых органов и молочных желез.

**Ключевые слова:** Пенстреп 400, пенициллин, стрептомицин, комбинированный антибиотик, фармакологические свойства, антимикробный эффект, бактерицидное действие, грамположительные бактерии, грамотрицательные бактерии.

## INTRODUCTION

The drug Penstrep 400 is among the widely used antibiotics in veterinary medicine. The main active ingredients of this drug are penicillin and streptomycin, which have a wide spectrum of antibacterial activity. The pharmacological effect and chemotherapeutic effectiveness of this drug, intended for cattle, play an important role in ensuring animal health. The combination of penicillin and streptomycin allows for the effective treatment of infectious diseases, including respiratory and digestive system infections. The use of this preparation contributes to the rapid elimination of infections and improvement of the general health of animals. Penstrep 400 can also be used for prophylactic purposes.

## PHARMACOLOGICAL PROPERTIES

Procaine penicillin G, a component of Penstrep 400, belongs to the narrow-spectrum penicillins class and has a bactericidal effect, especially against gram-positive bacteria (*Slostridium*, *Corynebacterium*, *Erysipelothrix*, *Listeria*, *Staphylococcus*, *Streptococcus*). Under the influence of the drug, it is important to reduce the activity of enzymes in the synthesis of peptidoglycogen necessary for microbes, as a result of which the growth and development of bacteria cease, and the activity of enzymes that hydrolyze peptidoglycan increases. The covalent bonds of bacteria and cell walls loosen. Growing microbial cells stop their division.

Another characteristic of the drug is the slow absorption of procaine penicillin G intramuscularly, which exhibits a prolongation effect, and its therapeutic concentration in the blood is maintained for 18-24 hours after a single injection in the form of a suspension. Penicillin accumulates in high concentrations in the lungs, kidneys, intestinal mucosa, reproductive organs, bones, pleural and peritoneal fluids, and in small amounts in the placenta and milk.[2, 42 b. 7, 1-3 b]

Dihydrostreptomycin sulfate, a component of Penstrep 400, belongs to the class of antibiotics streptomycins and has a broad spectrum of antimicrobial action. Many gram-negative bacteria have a bactericidal effect, especially (*Escherichia coli*, *Klebsiella*, *Pasteurella*, *Salmonella*, *Brucella*, *Haemophilus*, *Campylobacter*, and others). Its antibacterial effect is based on the interaction of streptomycin molecules with ribosomal parts of microbial cells. This leads to complex disruptions in the protein synthesis system of microbial cells. When streptomycin is administered intramuscularly, it is quickly absorbed and poorly binds to blood serum proteins. Its maximum concentration in blood plasma is observed after 1-2 hours of injection, and the therapeutic dose is maintained for 8-12 hours.

The drug is excreted from the body mainly through the kidneys and partially with bile. In the normal state of functioning of the kidneys, there is no accumulation. In the composition of the drug, streptomycin differs from penicillin in its effect on both the state of growth and reproduction of microbes. Acquired bacterial resistance develops slowly. A mixture of penicillin

and dihydrostreptomycin has a strong bactericidal and bacteriostatic effect on pathogenic microflora, each of which is used separately. [1,223-253 b. 6, 56-56 b.]

#### **APPLICATION**

It is recommended for cattle, sheep and goats, pigs, dogs, and cats for all gastrointestinal, respiratory, and urinary tract infections.

**Dosage.** Penstrep 400 is administered only intramuscularly. Before use, the liquid in the vial must be shaken until a uniform suspension is formed.

Cattle - 1 ml 20 kg weight 1 time a day for 3 days

Pig - 1 ml per 20 kg weight 1 time a day for 3 days

Calf, sheep-goat, piglet, cat - 1 ml 10 kg weight 1 time a day for 3 days.

Cattle should not be given more than 20 ml, pigs more than 10 ml, and small animals more than 5 ml per injection.

If there are no clinical changes in the sick animals within 2-3 days, the sensitivity of the microorganisms to the drug must be re-examined.

**Side effects.** If used in the indicated dosage, no adverse effects are observed. If the dose is not increased, oto-nephrotoxicosis is observed.

#### **APPLICATION IS PROHIBITED**

In cases of hypersensitivity to penicillin and streptomycin, renal and cardiovascular insufficiency, combined use of nephrotoxic drugs (neomycin, kanamycin, gentamicin) is prohibited, as well as in the last months of pregnancy.

The mechanism of chemotherapeutic action of Penstrep 400 is a combined antibacterial chemotherapeutic drug, the high effectiveness of which is explained by the synergistic effect of benzylpenicillin (penicillin G) and streptomycin sulfate at the molecular and cellular levels.

1. Chemotherapeutic mechanism of action of penicillin G Penicillin G belongs to the group of  $\beta$ -lactam antibiotics, which disrupts the synthesis of peptidoglycan, which is the main component of the bacterial cell wall. This process takes place in the following stages:

Penicillin binds to penicillin-binding proteins (PBPs) located on the bacterial cell membrane. Block the transpeptidation process. The strength of the peptoglycan layer is disrupted.

The cell wall cannot withstand osmotic pressure. As a result, the bacterial cell undergoes lysis and dies. Due to this mechanism, penicillin G has a bactericidal effect and is particularly effective against gram-positive bacteria at the division stage.

2. Chemotherapeutic mechanism of action of streptomycin Streptomycin belongs to the group of aminoglycoside antibiotics and affects protein synthesis in the bacterial cell. Its mechanism of action is subdivided into the following. Streptomycin binds to the 30S subunit of the bacterial ribosome. Causes misreading of the mRNA code. The synthesis of nonfunctional, defective proteins occurs. Bacterial metabolic processes are disrupted. Cell death occurs.

In addition, streptomycin disrupts ion balance by increasing the permeability of the cell membrane. This further enhances its bactericidal effect, especially against gram-negative pathogens.

3. Mechanism of synergistic chemotherapeutic action The combined action of two antibiotics contained in penstrep 400 creates pharmacodynamic synergism: Penicillin G weakens the cell wall. Streptomycin facilitates entry into bacteria. Deep blockage of protein synthesis occurs. The bacteria's defense mechanisms fail.

4. General chemotherapeutic effect on the body of cattle

After intramuscular administration, the drug is rapidly absorbed, forming a therapeutic concentration in the blood and tissues. In the focus of infection: the activity of the pathogenic microflora is suppressed. The release of endotoxins decreases. The mediators of inflammation weaken. General intoxication decreases. These processes lead to the rapid disappearance of clinical signs and restoration of the physiological state in cattle.

### CONCLUSION

Penstrep 400 is a combined antibacterial chemotherapeutic drug, the synergistic interaction of benzylpenicillin and streptomycin sulfate in its composition provides high pharmacological effectiveness. When administered intramuscularly, the drug is rapidly absorbed, forms therapeutic concentrations in the blood and tissues in a short time, and persists in foci of infection. Pharmacologically, Penstrep 400 has a strong bactericidal effect by disrupting the synthesis of bacterial cell walls and blocking protein synthesis. The simultaneous manifestation of these two mechanisms of action expands the antibacterial spectrum of the drug, creating high chemotherapeutic activity against gram-positive and gram-negative pathogenic microorganisms.

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