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TREATMENT OF MASTITIS IN COWS: AN OVERVIEW OF THE PHARMACEUTICAL MARKET FOR THE MOST COMMON INJECTABLE THERAPIES

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ЛІКУВАННЯ МАСТИТУ У КОРІВ, ОГЛЯД ФАРМАЦЕВТИЧНОГО РИНКУ НАЙПОШИРЕНІШИХ ПРЕПАРАТІВ ДЛЯ ІН'ЄКЦІЙНОЇ ТЕРАПІЇ

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Abstract

Background. *Mastitis is one of the most common diseases of dairy cows and causes significant economic losses due to reduced productivity, deterioration in milk quality, and increased veterinary costs. Under current conditions, the analysis of the availability and structure of the market for injectable drugs used in mastitis therapy is of particular importance.* ***Purpose.*** *To analyze the range of injectable medicinal products available on the modern pharmaceutical market of Ukraine for the treatment of mastitis in cows, evaluate their availability and pricing policy, and determine the prospects for expanding production and developing new products.* ***Materials and Methods.*** *The assortment analysis was carried out using the data of the State Register of Medicinal Products of Ukraine as of January 2026, the Compendium reference source, information from open sources, and veterinary pharmacy networks. Statistical, logical, and graphical methods of analysis were used.* ***Results.*** *It was established that the Ukrainian market is dominated by injectable antibiotics based on enrofloxacin, amoxicillin, ceftiofur, oxytetracycline, and cloxacillin. Non-steroidal anti-inflammatory drugs and immunomodulators also occupy a significant market share. Domestic manufacturers provide more than half of the market supply, while mono-drugs remain the predominant product type. The most common packaging format is 100 ml vials. An insufficient representation of combined products and injectable sulfonamides was identified.* ***Conclusions.*** *The market of injectable drugs for the treatment of mastitis in Ukraine is characterized by the dominance of classical antibiotics, a stable presence of supportive agents, and promising prospects for the development of combined and prolonged-release formulations. The obtained results can be used to optimize veterinary support for dairy farms and to plan the production of new medicinal products.*

Key words: *mastitis, injectable drugs, veterinary medicinal products, pharmaceutical market of Ukraine, marketing analysis.*

Анотація

Актуальність. *Мастит є одним із найпоширеніших захворювань молочних корів та спричиняє значні економічні втрати через зниження продуктивності, погіршення якості молока та підвищення витрат на ветеринарне забезпечення. У сучасних умовах особливого значення набуває аналіз доступності та структури ринку ін'єкційних препаратів для лікування маститу.* ***Мета роботи.*** *Провести аналіз асортименту ін'єкційних лікарських препаратів, представлених на сучасному фармацевтичному ринку України, які застосовуються для лікування маститу у корів, оцінити їх доступність та цінову політику, а також визначити перспективи розширення виробництва й розробки нових засобів.* ***Матеріали і методи.*** *Аналіз асортименту препаратів здійснювався на основі даних Державного реєстру лікарських засобів України станом на січень 2026 року, довідника «Компендіум», інформації з відкритих джерел та ветеринарних аптечних мереж. У роботі використано статистичний, логічний та графічний методи аналізу.* ***Результати та їх обговорення.*** *Встановлено, що на українському ринку переважають ін'єкційні антибіотики на основі енрофлоксацину, амоксициліну, цефтіофуру, окситетрацикліну та клоксациліну. Значну частку також займають нестероїдні протизапальні препарати та імуномодулятори. Вітчизняні виробники забезпечують понад половину ринку, а основним типом продукції залишаються монопрепарати. Найпоширенішим пакуванням є флакони по 100 мл. Виявлено недостатню представленість комбінованих препаратів та ін'єкційних сульфаніламідів.* ***Висновки.*** *Ринок ін'єкційних препаратів для лікування маститу в Україні характеризується домінуванням класичних антибіотиків, стабільною присутністю підтримуючих засобів та перспективністю розвитку комбінованих і пролонгованих форм. Отримані результати можуть бути використані для оптимізації ветеринарного забезпечення молочних господарств і планування виробництва нових лікарських засобів.*

Ключові слова: *мастит, ін'єкційні препарати, ветеринарні лікарські засоби, фармацевтичний ринок України, маркетинговий аналіз.*

1. Introduction

The dairy industry is a strategic sector of Ukraine's agricultural economy. According to the State Statistics Service, in 2024, milk production amounted to approximately 7.7 million tons, accounting for over 30% of all livestock revenues (State Statistics Service of Ukraine, 2025). Dairy products constitute a significant share of agricultural exports and are also an important source of income for farms and cooperatives. High productivity in the dairy sector directly affects the country's food security and the competitiveness of Ukrainian products in the European market (Food and Agriculture Organization, 2023). In addition to its economic significance, dairy farming has a social role – it supports employment in rural areas and provides the population with essential food products. At the same time, the stability of this sector directly depends on the health status of the herd, as cow productivity is determined not only by genetic potential but also by the level of veterinary control and treatment.

Diseases in cows, among which mastitis ranks among the most prevalent, significantly affect the efficiency of milk production. According to international studies, mastitis can reduce milk yields by 15–20%, with economic losses reaching 200–300 euros per cow annually (Bradley, 2002). In Ukraine, the prevalence of mastitis in high-yield herds is quite high, reaching up to 30–40%, which leads to significant milk losses and increased bacterial contamination (Koreiba, Suslova, & Chumak, 2025). Mastitis in cows is a multifactorial inflammation of the mammary gland tissue, the development of which depends on pathogens, the state of udder defense mechanisms, and the conditions of animal husbandry. The etiology of mastitis includes more than 140 microorganisms, among which the most common are *Staphylococcus aureus*, *Streptococcus agalactiae*, *Escherichia coli*, and *Streptococcus uberis* (Krömker & Leimbach, 2017).

Such a diversity of pathogens complicates the selection of effective treatment regimens, while therapy costs and milk withdrawal periods after drug administration further reduce the volume of marketable products. As a result, mastitis becomes not only a veterinary problem but also a factor affecting the economic stability of dairy farms.

Thus, the dairy industry occupies a significant place in the Ukrainian economy, but its development is limited by various factors, among which livestock diseases, particularly mastitis, are key. Preventing this disease, timely diagnosis, and the use of modern drugs contribute to maintaining herd productivity and ensuring the stable quality of Ukrainian dairy products on domestic and international markets.

Purpose. To analyze the range of injectable medicinal products available on the modern pharmaceutical market of Ukraine used for the treatment of mastitis in cows, assess their availability and pricing policies, and identify prospects for production expansion and the development of new products.

2. Materials And Methods

The analysis of the product range was carried out based on data from the State Register of Medicines of Ukraine (as of January 2026) and information from open sources regarding retail prices and availability in veterinary pharmacy networks. Statistical, logical, and graphical methods of analysis were used in the study.

3. Results and discussion

The treatment of mastitis in dairy cows is a complex, multi-component process that requires a combination of antibiotic therapy, anti-inflammatory agents, supportive therapy, and strict milk quality control. The primary goal of treatment is the rapid elimination of the infectious agent, reduction of inflammation, restoration of udder function, and prevention of complications. Drug selection should be based on the results of bacteriological milk testing, as empirical use of antibiotics without confirming pathogen susceptibility may contribute to resistance development, which is one of the major threats in modern veterinary medicine (Oliver & Murinda, 2012).

Injectable antibiotics remain the main method for treating severe forms of mastitis, when the infection extends beyond a single quarter of the udder and is accompanied by systemic manifestations. The most widely used are ceftiofur, amoxicillin (with or without clavulanic acid), enrofloxacin, cloxacillin, and oxytetracycline. Ceftiofur, a third-generation cephalosporin, has a broad spectrum of action and a short milk withdrawal period, making it a drug of choice for acute mastitis (Farmvisit, 2025). Amoxicillin is affordable and cost-effective, particularly effective against streptococci and staphylococci, and its combination with clavulanic acid allows overcoming resistance in β-lactamase-producing pathogens (Farmvisit, 2025). Cloxacillin demonstrates high activity against *Staphylococcus aureus*, making it important for treating staphylococcal mastitis (Sadivnytstvo, 2025). Enrofloxacin, a fluoroquinolone, penetrates udder tissues well and is used in severe and resistant infections

(Oliver & Murinda, 2012). Oxytetracycline serves as a reserve drug for mixed infections but has a longer milk withdrawal period, limiting its use in high-yield herds (ZVK, 2021).

Intramammary preparations are effective in localized mastitis cases, when the infection is confined to a single udder quarter. They ensure high concentrations of the active substance directly at the site of infection, allowing rapid suppression of the inflammatory process. These suspensions include penicillins, cephalosporins, aminoglycosides, and their combinations (Bradley, 2002). Their advantage is local action without systemic burden on the animal, but in severe cases, they have limited effectiveness and require combination with systemic therapy.

Sulfonamides occupy a separate place in mastitis treatment. Sodium sulfathiazole and sodium sulfadimethoxine, as well as their combinations with trimethoprim (co-trimoxazole), are most commonly used. Sulfonamides are primarily effective against streptococci and staphylococci but less effective against Gram-negative bacteria such as *Escherichia coli*. Their advantages include accessibility, relatively low cost, and the possibility of combination with other antibiotics or anti-inflammatory agents. They also have a longer duration of action compared to some classical antibiotics. Disadvantages include lower effectiveness compared to modern cephalosporins or fluoroquinolones, risk of resistance development, and potential toxicity in case of overdose (Oliver & Murinda, 2012).

Thus, injectable sulfonamides occupy an auxiliary role in mastitis treatment schemes. They can be useful in mild to moderate cases, particularly caused by streptococci and staphylococci, and as part of combination therapy with antibiotics or anti-inflammatory components to enhance treatment efficacy and reduce resistance risk.

The analysis of the range of injectable medicinal products for mastitis treatment in cows on the Ukrainian pharmaceutical market was conducted based on official data from the State Register of Medicines of Ukraine (State Register of Medicinal Products of Ukraine, n.d.), the Compendium directory (Compendium, 2026), and data from Tabletki.ua (Tabletki.ua, 2026) and websites of certain veterinary drug manufacturers (Brovapharma, 2026). The analysis considered trade names, composition, manufacturers, country of origin, and packaging types (vial volumes).

A literature review showed that, as of February 2026, the Ukrainian market mainly offers antibiotics (ceftiofur, amoxicillin, enrofloxacin, cloxacillin, oxytetracycline), as well as supportive agents – NSAIDs and immunomodulators. Injectable sulfonamides for mastitis treatment in cows are virtually absent from the state veterinary drug register, although sulfadimethazine, sulfathiazole, and sulfadimethoxine are primarily used in oral forms (powders, tablets, boluses) or as components of combination products, but not as injectable solutions.

An important complement to antibiotic therapy is the use of anti-inflammatory drugs, particularly flunixin meglumine and meloxicam, which reduce inflammation, pain, and fever, improve the general condition of the animal, and promote faster recovery (Koreiba, Suslova, & Chumak, 2025). In severe cases of mastitis, infusion therapy is applied to combat intoxication, as well as immunomodulators and vitamin complexes to support overall resistance (Koreiba, Suslova, & Chumak, 2025). The duration of mastitis treatment typically ranges from three to eight days, depending on the severity and the type of pathogen. The milk withdrawal period after administration of injectable antibiotics and sulfonamides is three to five days, requiring strict control to prevent drug residues in products (Farmvisit, 2025).

Thus, mastitis treatment in cows is a multi-component process combining antibiotic therapy, anti-inflammatory, and supportive agents. Injectable antibiotics remain the primary method for severe forms, intramammary preparations for mild and subclinical cases, and NSAIDs provide additional efficacy and treatment comprehensiveness. It should be noted that the current market situation for injectable mastitis treatments in Ukraine is affected by wartime conditions, meaning import supplies may be unstable, prices remain high, and availability of certain brands is limited.

The analysis (Table 1) showed that, as of January 2026, more than twenty injectable drugs for the treatment of mastitis in cows were registered on the Ukrainian pharmaceutical market. The study allows conclusions regarding market structure, dominant active substances, production geography, drug types, and packaging features. As shown in Table 1, the most represented groups of active substances are antibiotics: enrofloxacin, amoxicillin, ceftiofur, oxytetracycline, cloxacillin; nonsteroidal anti-inflammatory drugs (NSAIDs); and immunomodulators. Each group has specific pharmacological characteristics, spectrum of action, milk withdrawal period, and economic accessibility, which determine their role in veterinary practice.

As of the beginning of 2026, the market for injectable drugs used in the treatment of mastitis in

Table 1

Injectable solutions used for the treatment of mastitis on the pharmaceutical market of Ukraine as of January 2026

Active substance	Trade name	Manufacturer	Country	Type	Packaging
Ceftiofur	Excenel RTU	Zoetis	USA	Mono	Vials 50 ml, 100 ml, 250 ml
	Brovacef	Brovapharma	Ukraine	Mono	Vials 50 ml, 100 ml
	Ceftivet	Norbrook	United Kingdom	Mono	Vials 100 ml
Amoxicillin	Amoxinject	Livisto	Spain	Mono	Vials 100 ml
	Brovamox	Brovapharma	Ukraine	Mono	Vials 50 ml, 100 ml
	Amoxivet	Norbrook	United Kingdom	Mono	Vials 100 ml
	Amoxiclav Vet	Biofarm	Ukraine	Combination	Vials 100 ml
	Amoxilong	Biofarm	Ukraine	Mono (prolonged-release)	Vials 100 ml
Cloxacillin	Brovamast	Brovapharma	Ukraine	Mono	Vials 50 ml, 100 ml
	VetClox	Intervet	Netherlands	Mono	Vials 100 ml
Enrofloxacin	Baytril 5%	Bayer	Germany	Mono	Vials 50 ml, 100 ml, 250 ml
	Enroflon 5%	Brovapharma	Ukraine	Mono	Vials 50 ml, 100 ml
	Brovaflok	Brovapharma	Ukraine	Mono	Vials 100 ml
	Enroxil	Krka	Slovenia	Mono	Vials 100 ml
	Enrovet	Ukrzoovetprompostach	Ukraine	Mono	Vials 100 ml
	Enrolong	Brovapharma	Ukraine	Mono (prolonged-release)	Vials 100 ml
Oxytetracycline	Oxytetracycline 200	Norbrook	United Kingdom	Mono	Vials 100 ml
	TetraVet 200	Ukrzoovetprompostach	Ukraine	Mono	Vials 50 ml, 100 ml
	OxytetraVet	Livisto	Spain	Mono	Vials 100 ml
NSAIDs	Flunixin inj.	Intervet	Netherlands	Mono	Vials 50 ml, 100 ml
	Flunivet	Norbrook	United Kingdom	Mono	Vials 100 ml
	Meloxicam Vet	Biofarm	Ukraine	Mono	Vials 50 ml, 100 ml
Immunomodulators	Imunovit Vet	Brovapharma	Ukraine	Combination	Vials 100 ml
	ImmunoVet	Biofarm	Ukraine	Combination	Vials 100 ml

cows in Ukraine has developed into a distinct and relatively stable segment of veterinary pharmacy. It has a clear structure, well-defined leaders among active substances and manufacturers, and demonstrates a certain level of maturity. At the same time, the market is not static: it requires further development, diversification, and adaptation to current challenges, particularly the issue of antimicrobial resistance and the need for a comprehensive approach to treatment.

Antibiotics form the basis of the market (Fig. 1), with amoxicillin and enrofloxacin accounting for the largest shares. Together, they represent almost half of the total assortment (approximately 46%). This can be explained by their versatility, availability, and effectiveness against the main causative agents of mastitis. Amoxicillin, especially in prolonged-release formulations and in combination with clavulanic acid, is effective in the treatment of streptococcal and staphylococcal infections. Enrofloxacin, as a representative of fluoroquinolones, has a broad spectrum of activity, including Gram-negative flora, which makes it indispensable in many cases.

Ceftiofur accounts for approximately 12.5% of the market and is a strategic drug for severe cases of mastitis, particularly those caused by *E. coli*. Its main advantage is a short milk withdrawal period, which allows animals to return to production more quickly. Oxytetracycline and cloxacillin together make up about 21% of the market. Although they are less widely used, they remain important as alternative therapeutic options that help avoid excessive reliance on the two main antibiotic groups.

Supportive agents – nonsteroidal anti-inflammatory drugs (NSAIDs) and

immunomodulators – play a separate role. Their share is approximately 21%. While they are not primary treatments, they ensure a comprehensive therapeutic approach by reducing inflammation and pain, improving the general condition of the animal, and enhancing overall resistance. The further development of this segment can be considered a promising direction for the future.

The market analysis by manufacturers (Fig. 2) and by country of origin (Fig. 3) showed that Ukrainian companies account for slightly more than half of the market (54.2%). The market leader is Brovapharma (Brovapharma, 2026), which covers almost one-third of the market and offers a wide range of products – from classic antibiotics to prolonged-release formulations. Biofarm

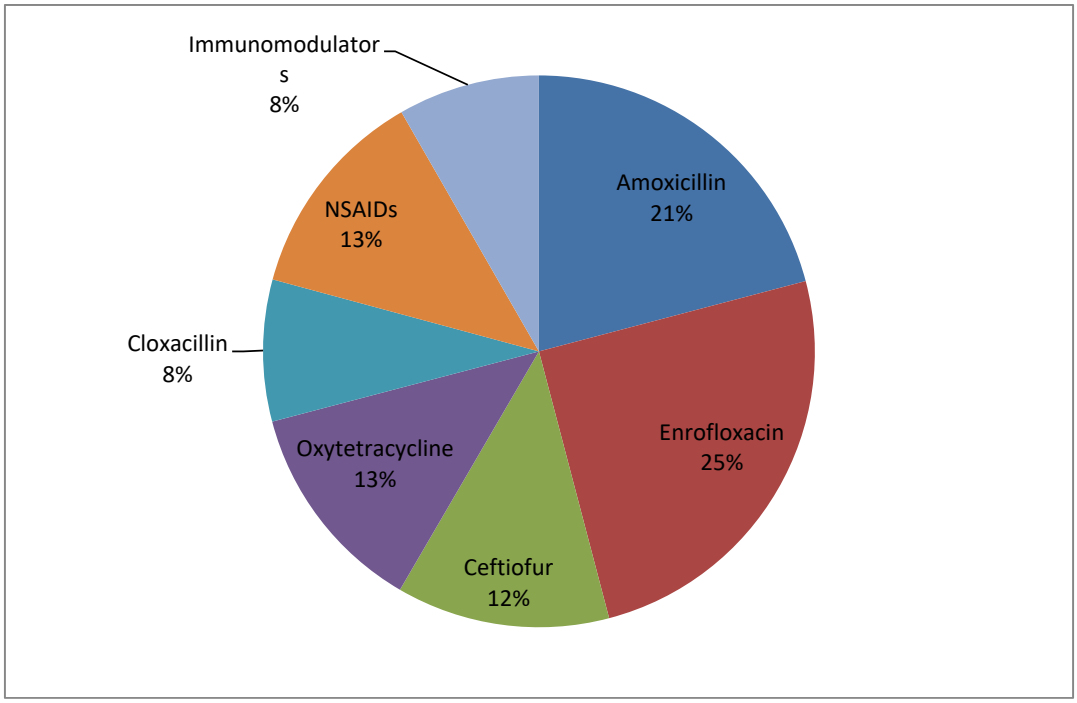

Fig. 1. Share of major groups of antibiotics and supportive agents in the market for injectable drugs used to treat mastitis in cows (January 2026)

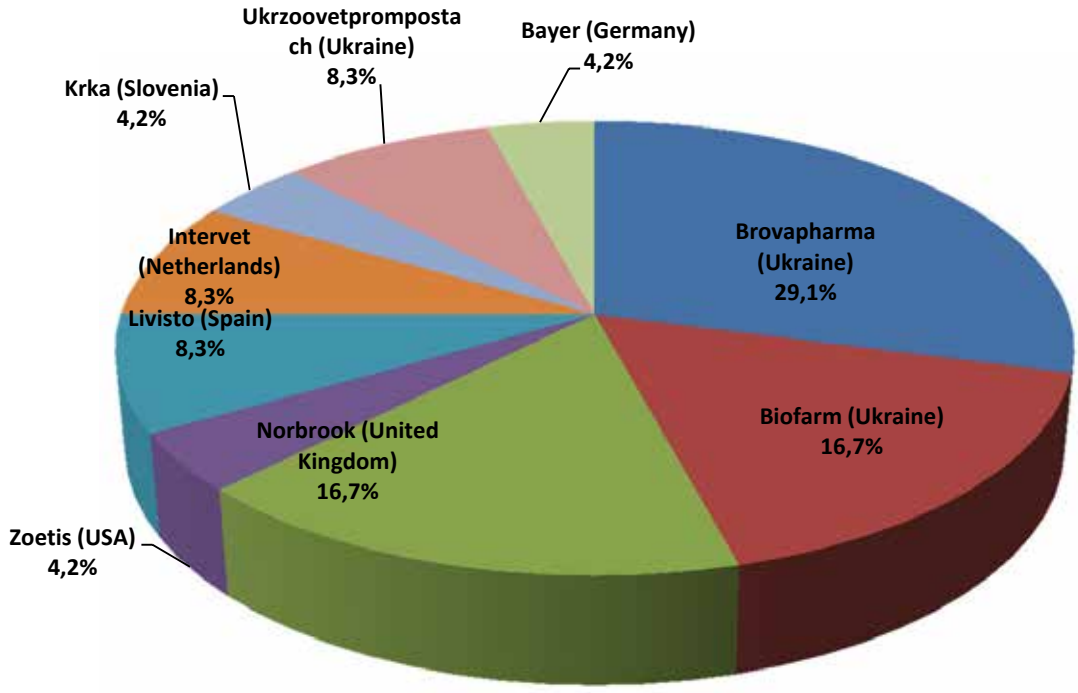

Fig. 2. Market structure by drug manufacturers

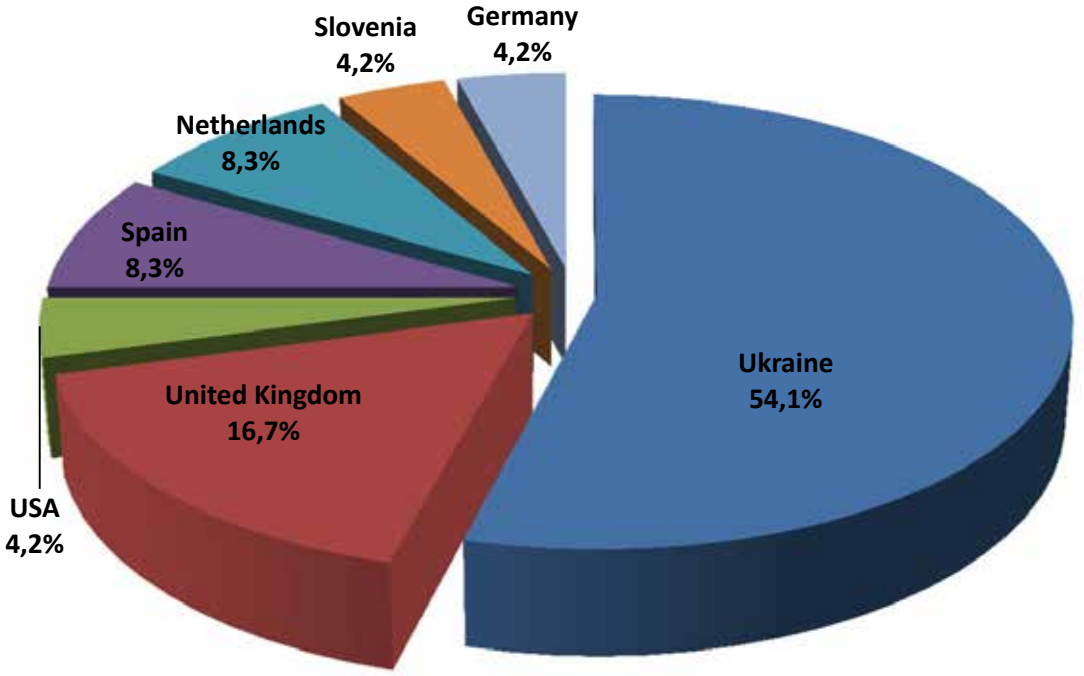

Fig. 3. Market structure of injectable drugs for the treatment of mastitis in cows by country of origin (January 2026)

holds approximately 16.7% of the market, specializing in combination drugs and NSAIDs. Ukrzoovetprompostach (Ukrzoovetprompostach PJSC, 2026), in turn, has a smaller share but provides key positions in the enrofloxacin and oxytetracycline segments.

Among international companies, the most represented are Norbrook (16.7%), Livisto (8.3%), Intervet (8.3%), KRKA (4.2%), Zoetis (4.2%), and Bayer (4.2%). Imported products occupy strategic niches, particularly in the ceftiofur segment and premium antibiotics. They are more expensive but offer high efficacy and international recognition.

The analysis of drugs by type (Fig. 4) showed a predominance of mono-drugs, accounting for 87.5%. These are classic antibiotics and NSAIDs, which are used in most cases. Combination drugs represent only 12.5% and include Amoxiklav Vet, Immunovit Vet, and ImmunoVet. Their role is to enhance treatment efficacy and provide a comprehensive therapeutic approach.

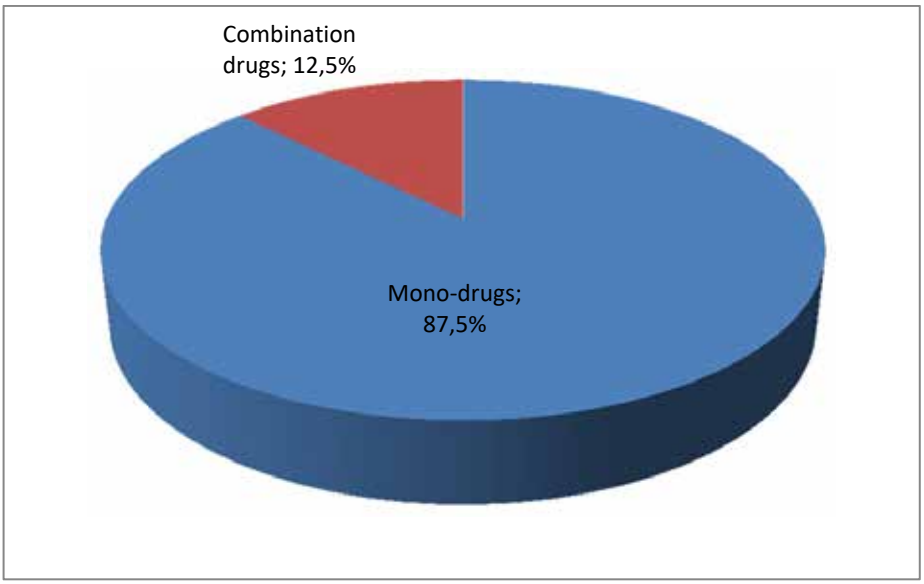

Fig. 4. Distribution of injectable drugs for the treatment of mastitis in cows by type

The review of drug packaging types showed that the standard is a 100 ml vial, which is present in all products. About one-third of the drugs are also available in 50 ml vials, which is convenient for small farms. Only two products (Baytril and Excenel) are available in 250 ml vials, aimed at large cattle herds. This packaging structure indicates a need for diversification to better meet the requirements of different consumer categories.

Drug prices also vary significantly depending on the manufacturer and country of origin. Ukrainian products are generally cheaper (200–400 UAH per 100 ml vial), making them accessible to most farmers. Imported equivalents, especially Zoetis and Bayer, are considerably more expensive (1,000–2,000 UAH per vial) but are positioned as strategic drugs for severe cases. NSAIDs and immunomodulators occupy the mid-price segment (200–500 UAH), providing a comprehensive therapeutic approach.

The conducted studies allowed the formation of a macro-outline of the target drug segment (Fig. 5) in the national pharmaceutical market, which reflects key structural characteristics: the largest drug group is enrofloxacin (25%); Brovapharma is the leading manufacturer (29.1%); Ukraine supplies the majority of the market (54.1%), where mono-drugs dominate (87.5%); and the standard packaging is the 100 ml vial, which is universal for all products in the sample.

4. Conclusions

The analysis of the injectable drug market for the treatment of mastitis in dairy cows in Ukraine as of January 2026 showed that enrofloxacin occupies the largest share (25%), followed by amoxicillin (20.8%), ceftiofur and oxytetracycline (each 12.5%), cloxacillin (8.3%), as well as supportive agents – NSAIDs (12.5%) and immunomodulators (8.3%). This structure indicates the dominance of classical antibiotics while simultaneously highlighting the growing role of supportive drugs in comprehensive therapy.

By drug type, mono-drugs dominate (87.5%), forming the basis of treatment, whereas combined formulations (12.5%) remain less numerous but promising, as they enhance treatment efficacy and reduce the risk of resistance. The leading manufacturer is Brovapharma (29.1%), covering all key antibiotic groups and offering prolonged-release formulations. Overall, domestic companies supply more than half of the market (54.1%), and their products are cheaper (200–400 UAH per 100 ml), making them more accessible to most farms compared to imported equivalents (1,000–2,000 UAH).

The standard packaging remains the 100 ml vial, which is universal for most farms. About one-third of the products are also available in 50 ml vials, convenient for small-scale farmers, while larger volumes (250 ml) are represented by only two imported products, aimed at large industrial complexes.

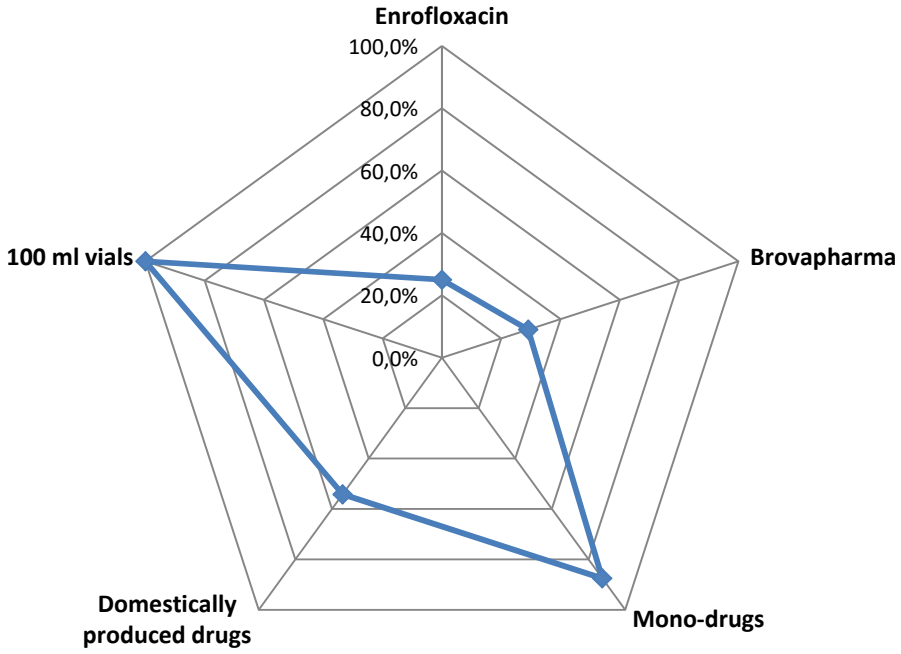

Fig. 5. Consolidated macro-outline of the injectable drug market

Thus, the injectable drug market for mastitis treatment in Ukraine is characterized by the dominance of classical antibiotics, a stable presence of supportive agents, and the gradual development of combined formulations. Future prospects lie in further expanding the range of domestic drugs, developing new combined and prolonged-release solutions, and reintroducing injectable sulfonamides, which are currently almost absent but could become an important addition to modern treatment protocols. This presents broad opportunities for Ukrainian manufacturers to strengthen their positions in the domestic market and ensure the long-term sustainability of veterinary practice.

Перспективи подальших досліджень

Подальші дослідження доцільно спрямувати на аналіз ефективності комбінованих ін'єкційних препаратів, розробку пролонгованих форм антибіотиків та оцінку перспектив використання ін'єкційних сульфаніламідів у ветеринарній практиці.

Обмеження дослідження

Дослідження базувалося на відкритих джерелах інформації та даних державних реєстрів, що може не повністю відображати фактичну доступність препаратів у різних регіонах України.

Конфлікт інтересів

Автори заявляють про відсутність конфлікту інтересів.

Використання штучного інтелекту

Для початкового пошуку літератури та формування структури огляду використовувався штучний інтелект ChatGPT, який допомагав систематизувати джерела за тематичними категоріями, а також використовувався для мовного редагування та структуризації тексту. Остаточний аналіз літератури та написання тексту виконано авторами самостійно.

Первинні дані та матеріали

Первинні дані дослідження доступні авторам та можуть бути надані за обґрунтованим запитом.

Інформація про фінансування

Дослідження виконано без окремого фінансового забезпечення. Витрати на публікацію матеріалів за кошт авторів.

Внесок авторів

Т. Федюк – збір матеріалів, аналіз ринку, написання тексту статті.

А. Миляничч – наукове консультування, редагування та узагальнення результатів дослідження.

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