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MINISTRY OF HEALTH OF UKRAINE
NATIONAL UNIVERSITY OF PHARMACY
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QUALIFICATION WORK

on the topic: **«DEVELOPMENT OF THE COMPOSITION OF VETERINARY DROP FOR THE TREATMENT AND PREVENTION OF CAT UROLITHIASIS»**

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ANNOTATION

As a result of the conducted research, the composition of the extemporaneous technology of the mixture for veterinary use for the treatment of urolithiasis in cats was substantiated. The stability and technological properties of the mixture were studied.

The organoleptic and physicochemical indicators of model samples of the mixture were determined according to the methods of the pharmacopoeia. According to the results of the conducted research, its stability was established.

The work is presented on 40 pages, includes 3 tables, 6 figures and 31 references.

Keywords: veterinary technology, cats, urolithiasis, pharmaceutical technology, composition.

АНОТАЦІЯ

В результаті проведених досліджень обґрунтовано склад екстемпоральної технології мікстури для ветеринарного використання для лікування сечокамяної хвороби котів. Вивчено стабільність та технологічні властивості мікстури.

Органолептичні та фізико-хімічні показники модельних зразків мікстури визначали згідно з методиками фармакопеї. За результатами проведених досліджень встановлено її стабільність.

Робота викладена на 40 сторінках, включає 3 таблиці, 6 малюнків та 31 літературне посилання.

Ключові слова: ветеренарна технологія, коти, сеокамяна хвороба, фармацевтична технологія, склад.

Content

INTRODUCTION

Recently, veterinarians in Ukraine and abroad have been paying significant attention to small domestic animals, such as cats, dogs, rodents and various exotic species, in particular, to providing them with the necessary veterinary care. One of the most pressing problems in the field of veterinary nephrology is urolithiasis, or urolithiasis in cats. This pathology occupies a leading place in the structure of diseases of the genitourinary system among cats in terms of the frequency of diagnosis and the number of deaths. It is placed on the same level as cardiovascular diseases, oncological pathologies and traumatic injuries.

The causes and mechanisms of urinary stone formation are still not fully understood. The animal body has a natural mechanism for the effective removal of toxic metabolic products. However, under certain circumstances, these processes are disrupted, which leads to the formation of stones in the kidneys and urinary tract. Statistics show that more than 50% of domestic cats over three years old face this problem, and neutered animals often show changes in the functioning of the renal system.

Diagnosis of urolithiasis is based on the study of morphological and biochemical parameters of the blood, which indicate metabolic disorders, as well as urine tests. In addition, treatment and prevention programs are used, which include etiotropic, symptomatic, rehydration, replacement and rehabilitation therapy.

Modern methods of treatment and prevention of urolithiasis in cats are often insufficiently effective and do not always meet the expected results. In the scientific literature on veterinary medicine, data on the seasonal dynamics of the disease, age, breed, sex and species-specific aspects of urolithiasis are not sufficiently described. There is also a lack of detailed materials on differential diagnosis and the development of complex therapeutic approaches in the treatment of this pathology.

The purpose was to develop the composition and technology of an extemporaneous veterinary mixture for the treatment of urolitiasis using plant extracts.

To achieve the goal, it is necessary to solve the following **tasks:**

- analyze and summarize modern literary data on the current state of treatment of cats urolitiasis;
- conduct an analysis of the extemporaneous formulation of soft drugs for the treatment of dermatological diseases;
- to theoretically and experimentally justify the composition of extemporaneous ointment based on plant raw materials (herbs, rosehip and chamomile oils);
- to develop the optimal technology of extemporaneous ointment for the treatment of dermatological diseases.

Research objects. Herbs extracts, purified water; model samples of mixture.

Subject of study. Pharmaco-technological studies of mixture and model samples of the mixture for the treatment of urolitiasis diseases for cats.

Research methods. Organoleptic, physicochemical, pharmacotechnological, statistical.

Practical significance of the obtained results. Physico-chemical studies (description, pH) of the mixture for the treatment of urolitiasis diseases for cats were conducted .

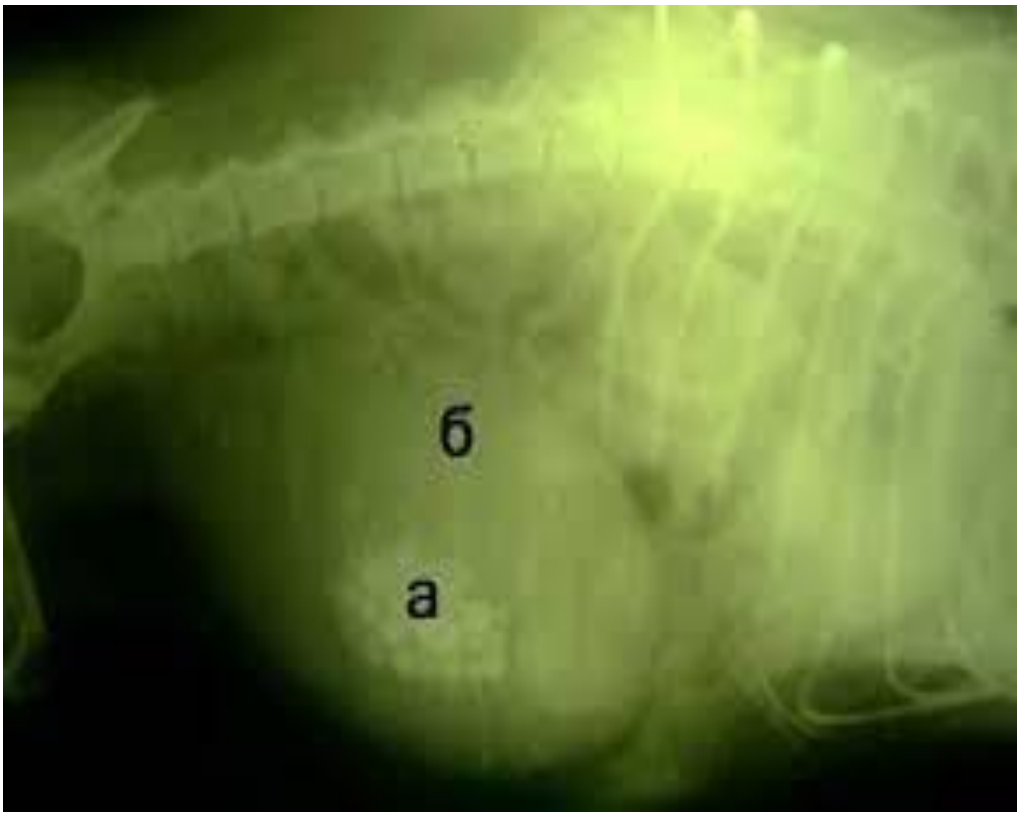
The obtained results of experimental studies can be used in the development of the technology of this medicinal product.

Scientific novelty. For the first time, the main physicochemical parameters of the new mixture for the treatment of urolitiasis diseases for cats were investigated.

CHAPTER 1
REVIEW LITERATURE

1.1. Etiology, pathogenesis and clinical symptoms urolithiasis in cats

Urolithiasis or urolithiasis (UCD) is a pathology that occurs due to metabolic disorders in the body, leading to the formation of stones in the kidneys, bladder, urinary tract and canal. The disease is manifested by urinary colic, anuria, dysuria, ischuria, hematuria and crystalluria. An illustration on a radiograph shows uroliths and an overfilled bladder in a cat.



Rice. 1.1. Radiograph abdominal cavities in cat by urolithiasis:

and – uroliths, b – crowded bladder

Experts are convinced that the main trigger of the disease is tubulopathies (enzymopathies). Other important factors are considered to be impaired blood circulation in the kidneys, inflammatory processes, dysfunction of the parathyroid gland, deficiency of retinol, ascorbic acid, cholecalciferol, and B vitamins. A significant role is also played by the improper diet of domestic cats with an excessive

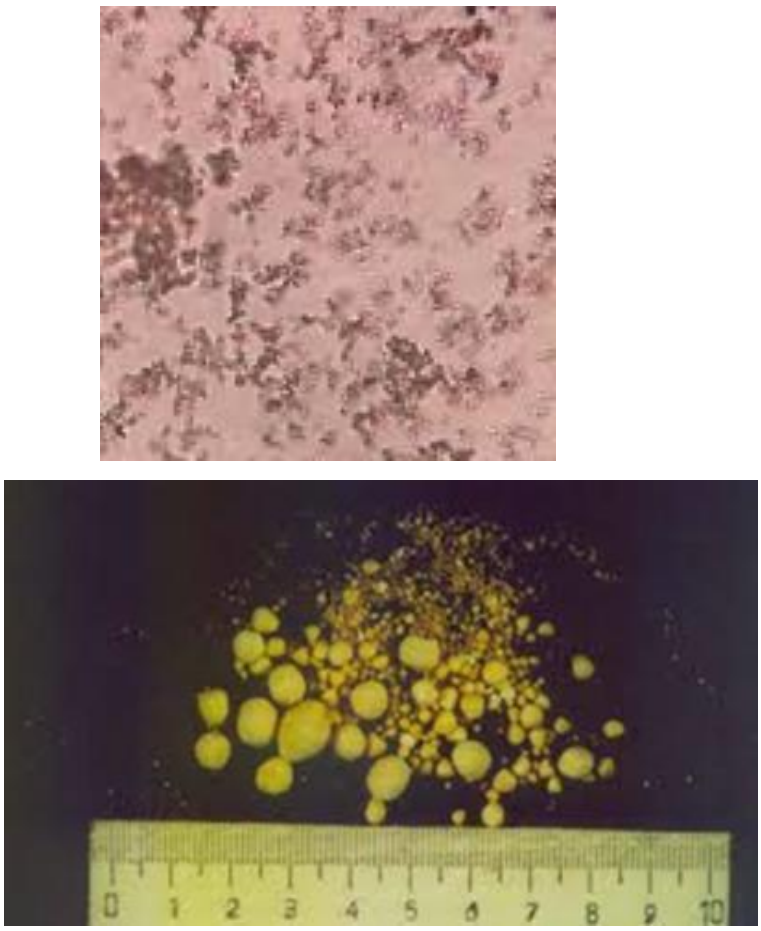
amount of dry food, which changes the physiological properties of urine, in particular its pH.

Two types of stones are most commonly formed in cats: struvite (magnesium and ammonium phosphate) and oxalate (calcium oxalate). One of the main causes of SCS is considered to be regular feeding of low-quality dry food, the formulation of which does not maintain the required pH (6.0–6.5) and contains excess salts, which overload the urinary system. Other risk factors include anatomical abnormalities, urinary tract infections, stress and tumors.

Endogenous (internal) and exogenous (external) factors are involved in the development of urolithiasis. Among the external ones are climatic and biogeochemical conditions. For example, high temperatures reduce diuresis, concentrating urine, while low temperatures contribute to its dilution. The mechanical composition of water is also important - water with an excess of lime salts reduces the acidity of urine and increases the concentration of calcium salts. Untimely replacement of the tray filler can lead to delayed urination, which provokes stagnation, inflammation and stone formation.

Dietary factors also play a significant role. Excessive consumption of protein food complicates purine metabolism and contributes to urolithiasis. In turn, a plant and lactic acid diet create favorable conditions for the formation of alkaline stones. Hypovitaminosis A is also associated with the development of SCH.

Endogenous factors include hormonal imbalance. In females, the risk of developing the disease is reduced by about half after sterilization, while in neutered cats it increases due to metabolic disorders and a tendency to obesity. In general, SCH in cats is more severe than in cats.



Pic. 1.2. General appearance uroliths:
and- salts urine (inorganic precipitate); b) to urinate

Anatomical features, in particular the S-shaped bend of the urethra in front of the os penis, inhibit the movement of urine and contribute to the crystallization of salts with the formation of stones. The small diameter of the canal after early sterilization can also provoke the formation of stones. Endogenous factors also include congenital anomalies of the development of the urinary system, pathology of the digestive tract and infection.

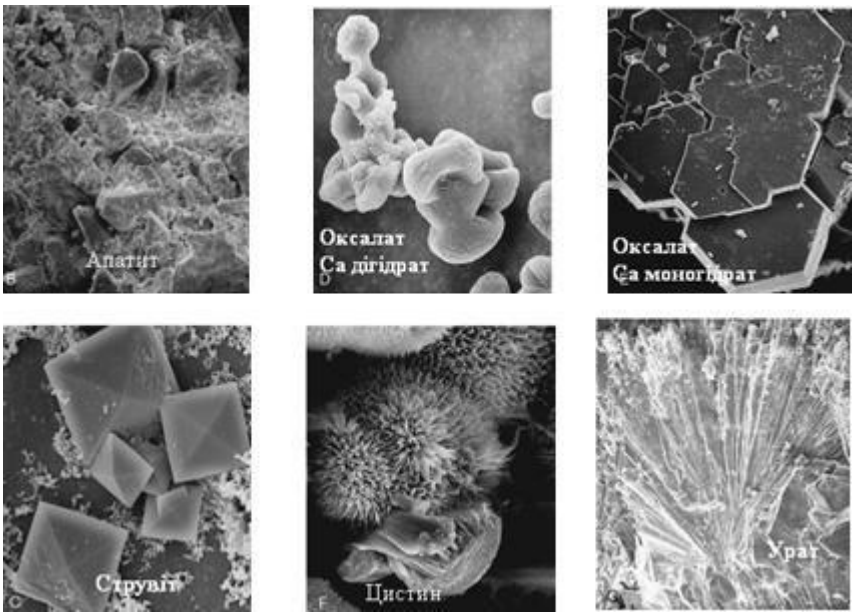
A factor contributing to the formation of uroliths in cats may be the relatively small diameter of the urethra, which is formed as a result of early sterilization [4].

Other factors include:

1. Developmental abnormalities of the urinary system.
2. Pathologies of the functioning of the gastrointestinal tract.
3. Infectious diseases.

The results of scientific research, which included the analysis of 6335 urolith samples, were performed using the methods of polarized light microscopy and X-ray diffraction. The study found that the main component of uroliths is struvite (magnesium, ammonium, phosphate hexahydrate), as well as other components such as calcium oxalate (monohydrate or dihydrate), ammonium urate, xanthine, cystine or calcium phosphate, or their combinations. The most common type of urolith is struvite [5].

Observations of the microscopic structure of different types of bladder crystals demonstrate significant variability in their composition (Fig. 1.3.).



Pic. 1.3. Appearance different by composition crystals urinary bladder under an electron microscope

Over the past 10 years, there have been notable changes in the mineral composition of uroliths in cats, with the incidence of calcium oxalate having substantially caught up with that of struvite [6]. Similar patterns have been observed in both dogs and human medicine.

Despite numerous attempts to explain this phenomenon, no consensus has been reached. Possible risk factors for the formation of calcium oxalate stones include: hypercalciuria (caused by hypercalcemia, excessive absorption of calcium in the gastrointestinal tract, impaired glomerular filtration); nutritional factors

(excess sodium, protein, vitamins B and C); glucocorticoid action; hyperoxaluria; hypocitrate aciduria; macromolecular inhibitor defects, and urinary or systemic acidosis.

Additionally, breed, gender, and age predisposition should be taken into account. Most likely, the formation of calcium oxalate uroliths is a multifactorial process in which several mechanisms are involved simultaneously.

Urolithiasis is a common disease in cats over 10 years of age. Struvite stones are formed when the urine is oversaturated with magnesium, ammonium, and phosphorus at an alkaline pH. This process is accompanied by a disruption of the balance between hydrophilic and hydrophobic colloids, the appearance of desquamated epithelium, and other changes. Infected urine has an elevated pH, which increases in the range of 7.5 to 9.

Urinary stones cause mechanical damage to the mucous membrane of the urinary tract, causing bleeding or hematuria. The development of urolithiasis can also be accompanied by inflammatory processes in the urinary tract. In this case, mechanical damage and blockage of the mucous membrane by stones lead to stagnation of urine, which prevents the outflow of urine from the proximal nephron, causes dilation of the tubules and the penetration of secondary microflora. This causes catarrhal-purulent inflammation of the bladder (urocystitis), renal pelvis and kidneys (pyelonephritis).

Causes of urinary tract infection (UTI) in cats

Bacteria, fungi, parasites and even viruses can cause infections of a cat’s urinary tract. These microorganisms, most commonly bacteria from the skin, enter the body via the urinary tract, travel up the urethra and typically settle in the bladder.

The primary bacteria involved in feline UTIs are Escherichia coli (E. coli), Staphylococcus, Proteus, Chlamydia, Enterococcus, Klebsiella, Streptococcus, Enterobacter and Pseudomonas, with E. coli being the single most common pathogen in both acute and recurrent UTI in dogs as well as cats. Occasionally, microorganisms other than bacteria are responsible, including mycoplasma, viruses,

algae and fungi. Although much less common, most fungal UTI in dogs and cats is caused by Candida spp.

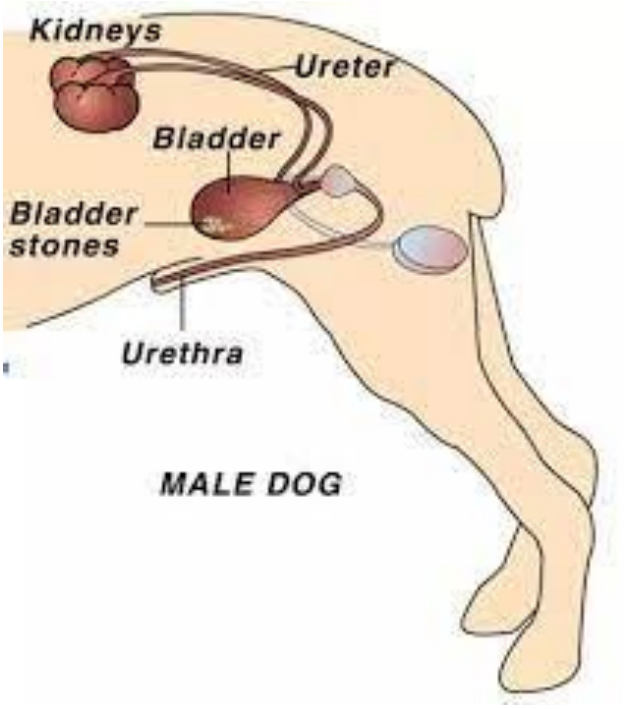
Bacteria simply ascending the cat's urinary tract without any reason or predisposing condition is uncommon, but not impossible. Some cats have "idiopathic" UTIs, meaning that the cause of their infection is unknown.

In most cases, the predisposing or contributing factors for cat UTI may be one or more of the following:

- Age plays a role in the development of a cat UTI, with the incidence being much higher in older female cats, particularly those over the age of 10 years; in young cats, incidence of UTI is low.
- Cats with compromised immune systems or other health complications have reduced defences for fighting infections, and hence have a greater incidence of UTI, than the general population. Underlying medical conditions associated with feline UTIs include:
    - Diabetes mellitus
    - Renal failure
    - Hyperthyroidism
    - Feline leukemia virus (FeLV)
    - Feline immunodeficiency virus (FIV)
- Cats who have bladder stones (uroliths) are prone to recurrent UTIs; it is essential that bladder stones are removed or dissolved in order to restore bladder health.
- Stress is thought to play a role in developing a cat UTI; cats are typically creatures of habit and easily become stressed from a change in routine, a new baby or pet, or a move to a different house.
- Elevated urine pH from any cause creates a bladder environment that is primed for bacterial overgrowth.
- Certain allergies (also called "immune-mediated hypersensitivities") can contribute to bladder irritation, inflammation and infection.

- A more recent cause of recurrent UTI is the emergence of bacteria resistant to antibiotic drugs (antimicrobials).
- Long-term administration of steroid medications can suppress the immune system, increasing a cat's chances of contracting urinary tract infections.
- Free-roaming outdoor cats are more likely to develop persistent UTI, largely because they tend to have veterinary check-ups less frequently than indoor cats, and owners are less likely to observe any symptoms.

Until the moment of pronounced violation of urine outflow or obstruction of the urinary tract, the disease may remain latent. However, laboratory examination of urine in the early stages allows to detect pathology. When a blockage occurs, the disease manifests itself with a characteristic triad of symptoms: urinary colic, difficulty urinating and a change in the composition of urine. Anxiety attacks occur suddenly: the animal constantly changes its body position, lies down and gets up, looks at its stomach, assumes a position for urination. Urine excretion becomes difficult, with minimal volumes or even single drops, which can lead to ischuria. Overflowing of the bladder in cats for 48 hours causes uremia. In such cases, increased body temperature, decreased appetite (hyporexia) and dehydration (hypovolemia) are observed.



Pic. 1.4. Characteristic of urotiliasis in the male dog

TABLE 1.
Medical Versus Surgical Treatment for Struvite Urolithiasis

ADVANTAGES	DISADVANTAGES
Surgical	
• Allows definitive diagnosis of urolith type via quantitative analysis • Allows surgeon to correct any concurrent or predisposing anatomic abnormalities (eg, urachal remnants, urinary bladder polyps) • Enables collection of urinary bladder mucosal samples for bacterial culture if urine yields no growth on culture	• Requires anesthesia • Surgery is invasive, with potential for complications • Associated with possible incomplete urolith removal • Often associated with persisting underlying causes; therefore, recurrence is likely and medical management still necessary
Medical	
• Lower initial costs • Noninvasive • Lower complication rate	• Total cost similar to that of surgical treatment due to involved follow-up protocol • Follow-up frequently involves urinalyses, bacterial cultures (if uroliths associated with bacterial UTI), and imaging • Considerable owner compliance required for several weeks to months during follow-up • Contraindicated in cats with urolith-induced obstructive uropathy or nonstruvite urolithiasis

Palpation reveals tenderness of the kidneys and bladder. Urine becomes turbid with impurities of sand, which quickly settles, and various crystals (struvite or oxalate). Characteristic is an ammonia odor and reddish color due to blood impurities. Laboratory tests reveal proteinuria (mainly albuminuria with a protein concentration of 0.5–1%), hematuria (presence of blood in the urine), renal edema, arterial hyperemia, oliguria (reduced diuresis) or even complete anuria. Uremia is accompanied by an increase in amine nitrogen. The relative density of urine increases to 1.031. Renal epithelium is detected in the sediment, and congestive cardiac edema can also be diagnosed.

Acute nephritis usually lasts two to three weeks, while the chronic form can have a long course - months and years. Chronic diffuse nephritis is often complicated by the development of nephrosclerosis. In the focal form of nephritis, the prognosis is favorable with timely treatment; at the same time, the prognosis is cautious in the diffuse form.

1.2. Modern methods of diagnosing urolithiasis in cats

Domestic cats often suffer from diseases associated with impaired normal functioning of the urinary system. Such diseases can be caused by a combination of numerous factors and are characterized by common clinical signs. One of the first manifestations of bladder inflammation is frequent urination, and urination often occurs in unusual or unacceptable places.

When urolithiasis is suspected or confirmed, it is important to pay attention to the characteristic clinical signs: frequent, short and painful urination, possible blood in the urine, periodic pain syndrome, unnatural body position during urination. Also, urine often has a sharp unpleasant odor. Additional instrumental methods are used to clarify the diagnosis, including ultrasound diagnostics, radiography, urethrocystoscopy, as well as a general clinical examination of urine.

Ultrasound examination allows you to detect changes in the organ under study: assess its size, thickness and integrity of the walls, detect the presence of stones in the urinary system or neoplasms.

Pic. 1.4. Ultrasonographic image urinary bladder, filled with uralite

Recent data from leading clinicians indicate that the diagnosis of urolithiasis is complicated by the failure to detect stones in the bladder during clinical examinations, although signs of bladder inflammation may be present. This necessitates the use of additional instrumental methods, such as ultrasound diagnostics (US) and radiography, to select adequate treatment tactics. The combination of such factors causes an increase in the number of deaths associated with urolithiasis in domestic cats. In light of this, it remains important to improve the methods of diagnosis, treatment and prevention of urolithiasis, which is emphasized by researchers, in particular E. Chandler (2002) and S. Osborne (2000). Ultrasound diagnostics, being a relatively new and modern method in domestic veterinary medicine of small animals, demonstrates high informativeness in the diagnosis of this disease.

The use of the bladder perfusion method during ultrasound is a convenient, highly effective and informative approach for the diagnosis of urolithiasis in small animals. The introduction of a sodium chloride solution into the bladder cavity ensures its filling, improves the visualization of calculi and urinary sediment. This method is especially useful in complex cases, increasing the accuracy of the diagnosis.

At the same time, visualization of concrements in the urinary bladder is often complicated, in particular in the presence of small stones or sand that are intimately adjacent to the bladder wall or attached to the mucous membrane due to inflammatory processes (so-called "soldered" concrements). In human medicine, special techniques are used that contribute to clearer visualization of small objects due to their movement inside the bladder. One of such techniques is perfusion of the urinary bladder directly during ultrasound. However, the use of this method in domestic cats is practically not covered in the domestic scientific literature.

Modern approaches to diagnostics using instrumental methods, combined with laboratory urine analysis, allow for an accurate diagnosis and localization of pathological changes. Determination of epithelial cells, erythrocytes, leukocytes,

changes in urine pH and crystallization of salts allows for the development of an effective treatment strategy and preventive measures.

Thus, the diagnosis of urolithiasis in cats is based on the analysis of clinical symptoms, collection of medical history, examination of urine sediment under a microscope, and ultrasound diagnostics using the perfusion method, which significantly increases the efficiency of detecting the disease.

1.3. Methods and stages of treatment and prevention of urolithiasis in cats

Methods and stages of treatment and prevention of urolithiasis in cats are key aspects of veterinary medicine, since kidney and urinary system diseases are widespread among cats of all ages. Researchers from the USA note that every third cat over the age of 12 suffers from one form or another of renal failure. Among the main pathologies of the urinary system in cats, idiopathic cystitis, urolithiasis, infectious cystitis, neoplasms and anatomical disorders are distinguished. Modern developments include drugs for dissolving uroliths and preventing their re-formation, as well as surgical methods for removing stones consisting of calcium oxalate, ammonium urate and cystine.

Diseases of the urinary system are characterized by changes in the urine: hematuria, pyuria, proteinuria and crystalluria. However, early differential diagnosis remains a difficult task. This applies, in particular, to acute and chronic renal failure, pyelonephritis, glomerulonephritis and urolithiasis, because it is timely diagnosis that is the key to successful treatment. To this end, research is being conducted to introduce new laboratory markers - the so-called "gold standards" for the diagnosis of kidney and urinary system diseases. These markers will allow for more accurate differentiation of pathologies and analysis of their impact on other organs.

A significant part of the clinical symptoms of urolithiasis depends on the degree of obstruction of the urinary tract and impaired urodynamics. Treatment in such cases is quite complicated, expensive and not always effective. That is why an important task of veterinary medicine is the development of effective treatment regimens for cats with urolithiasis. To do this, it is necessary to study the factors that contribute to the formation of stones in the bladder, including breed, age, sex, weight

of the animal, localization of stones, method of their removal, concomitant diseases or relapses, infectious processes and nutritional characteristics.

The developed methods for dissolving and preventing the formation of struvite stones in cats have been a significant step forward. However, methods for dissolving calcium oxalate crystals still do not exist due to the unknown causes of their formation. The main emphasis is on minimizing the risk of recurrence. The main goal of treatment in acute cases of urolithiasis is to remove stones or sand from the animal's body to relieve pain and alleviate the condition in the short term.

Among the main approaches to treatment are:

1. Bladder lavage. The procedure is performed in a veterinary clinic under anesthesia using antiseptic solutions. It is aimed at removing sand or small inclusions.

2. Ultrasonic or laser stone crushing. This modern method allows you to effectively break down struvite or oxalate stones that are excreted from the body with urine.

3. Surgical removal of stones from the ureters. This method involves surgical intervention under anesthesia and is effective in complex cases, although it is associated with risks to internal organs.

To treat this disease, drug therapy is used, which includes various pharmacological agents.

- Antibiotics: effectively fight bacterial infections (e.g. benzylpenicillin, ampicillin sodium, ceftriaxone, amoxicillin).

- Analgesics: reduce pain and promote faster recovery (analgin, amidopyrine, aspizol, aspirin, paracetamol, sedalgin, etc.).

- Antispasmodics: relieve the condition by relaxing the urinary system (atropine sulfate, papaverine hydrochloride, no-shpa, spasmalgon, baralgin and others).

- Antiseptics: help heal micro-injuries to the urinary tract and urethra, while preventing the development of secondary infections.

- Diuretics: natural remedies such as birch sap, decoctions of horseradish or chicory roots, and infusions of fennel seeds.

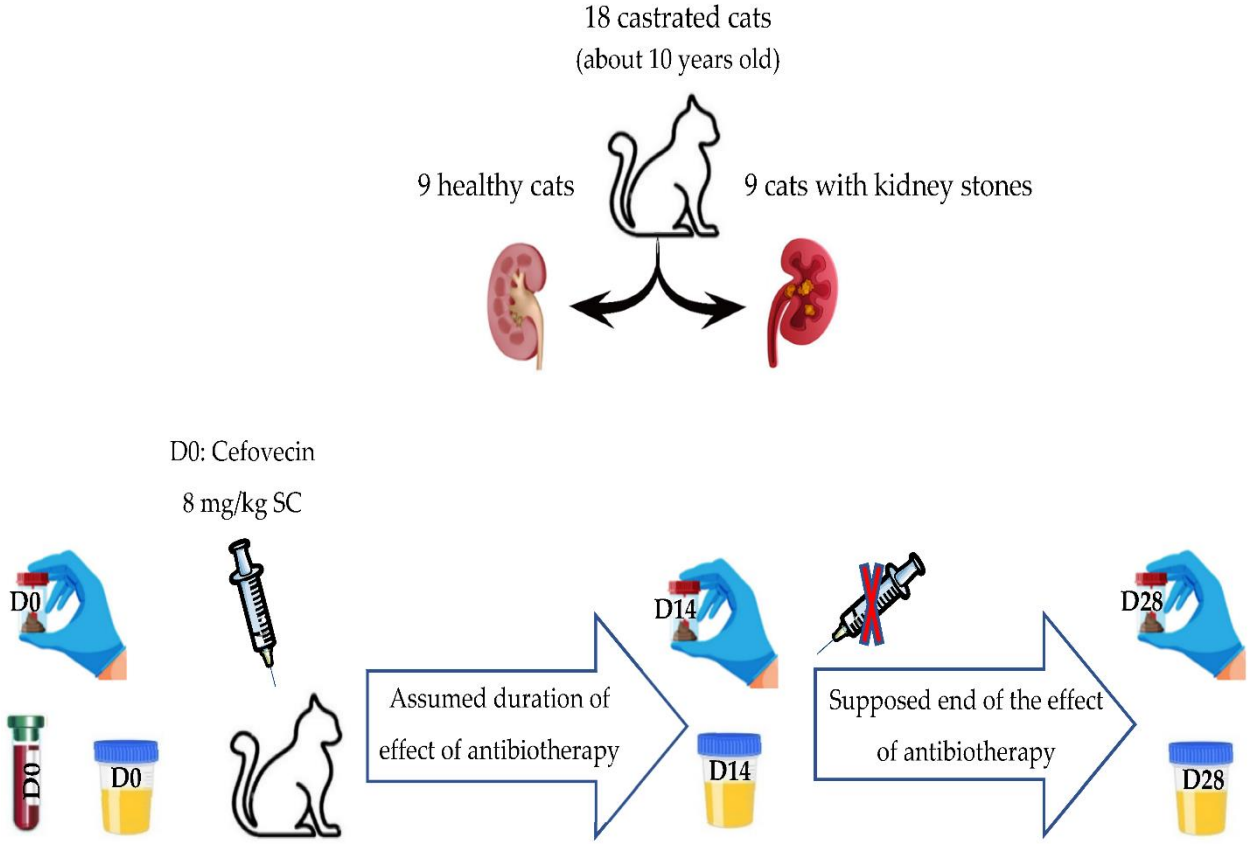
- Urease inhibitors: acetohydroxamic acid.

- Hemostatic drugs: etamzilate.

- Stone dissolving agents: for example, Erwin the cat.

- Bladder catheterization: used using furatsilin or dekasan with simultaneous administration of 0.5% novocaine solution through a catheter into the urinary tract.

- Diet therapy: a pH-controlled diet that stimulates urination and raises the urine pH to 6.0–6.5. The diet involves a limited amount of minerals (especially magnesium) and a moderate increase in sodium chloride intake to maintain fluid intake.



Pic.1.5 Using of antibiotics

Urolithiasis remains an unpleasant and threatening disease, so the priority is to prevent its occurrence. The main task of preventive measures is to reduce the concentration of minerals in the urine, which can form stones. To do this, you should provide your pet with a sufficient amount of clean drinking water and a balanced

diet. Veterinarians and experienced breeders recommend carefully choosing the daily diet of the animal.

High-quality ready-made premium or holistic foods can meet your pet's nutritional needs without harmful additives. A balanced menu is often enriched with vitamins and minerals to maintain good health and longevity of your pet. In the presence of urates, allopurinol and a diet with a reduced meat content are recommended; the basis of the diet should be flour products, potatoes and dairy products. For oxalates, margulit is prescribed.

Brands such as Royal Canin, Hill's, Advance and Purina Pro Plan offer specialized foods to support the health of the urinary system of animals. For example, Royal Canin produces special lines for cats with kidney diseases, which are available in both dry and canned form. The choice between them should correspond to the preferences of the pet itself. This approach to nutrition allows you to maintain good health and health of the cat for many years.

Ensuring an optimal drinking regimen is a key factor in maintaining normal electrolyte balance in the body, which is of great importance for the prevention of various diseases. Physical activity plays an important role in maintaining kidney health and overall metabolism. Active movement activates metabolism and promotes faster excretion of waste products from the body. If the pet owner does not always have the opportunity to devote enough time to physical games with the animal, it would be advisable to consider purchasing an interactive toy. Such an accessory will not only interest the animal, but also prevent boredom during your absence. Modern manufacturers offer a wide range of gaming devices for cats, ranging from logical interactive toys to high-tech electronic devices that can stimulate the activity of even the most passive pets.

The issue of weight control is extremely relevant for cats, since obesity is one of the most common problems that significantly affects their health. Excess body weight not only creates an excessive burden on organs and systems, but also significantly increases the risk of developing urolithiasis. Thus, a balanced diet and regular physical activity are mandatory components of animal care. This problem

becomes especially acute in cases of castrated and elderly cats, which are prone to reduced activity and weight gain. To ensure the proper level of prevention, it is recommended to visit a veterinarian twice a year and conduct an ultrasound examination of the bladder, which allows for timely detection of possible pathological conditions.

Following preventive measures is an effective way to prevent the development of urolithiasis and maintain your pet's health, activity, and cheerfulness for a long time.

Adverse reactions, often completely unknown to people who use herbal drugs, have been reported for many medicinal plants, although these are well known for their efficacy (Table 2) [29, 30]. In fact, the opinion that medicinal plants are mostly harmless (“ *natural = safe* ”) is widespread, not only in the normal population using phytotherapy, but also in practitioners working in this field. As a result, medicinal plants are often used in self-medication without consulting a doctor. Sometimes, many people who use herbal drugs for themselves also administer such products to their pets without the prescription of a veterinarian. These habits increase the risk of adverse reactions, such as allergies. Drug interactions, although infrequent, can also occur between herbal drugs and synthetic ones or with concomitantly used herbal therapies. Other specific contraindications could be represented by pre-existing pathologies (for example, peptic ulcer, kidney and hepatic failure) or surgery that could increase the risk of adverse effects by modifying the kinetics of the active principles. Finally, the quality is very important for the safety of herbal drugs; in fact, adverse effects could occur because of the presence of residues of environmental pollutants (heavy metals, mycotoxins, radionuclides) in the phytotherapeutic product [31].

In 1997, the American Herbal Products Association (AHPA) proposed a classification of the medicinal plants into 4 classes: the first class includes plants with a large margin of safety, such as calendula, hawthorn, euphrasy, lavender, taraxacum, nettle, valerian, camomile, echinacea, peppermint, lemon-balm, and thistle; the second class, further subdivided into four subclasses, includes herbs for

which some limitation exists, such as artemisia, St. John's wort, sage, liquorice; the third class includes herbs for which scientific evidence exists to make necessary the supervision of a specialized practitioner; finally, the fourth class includes all herbs not yet classified in the previous classes [32].

Conclusions to the first chapter

The problem of urolithiasis remains extremely relevant due to its significant prevalence among small animals, complex and prolonged course of the disease with possible serious complications, as well as a high rate of stone recurrence. Despite significant progress in the diagnosis and treatment of this pathology, a significant number of animals continue to suffer from urolithiasis.

Forecasts of numerous scientists indicate a tendency towards a further increase in the frequency of this pathology, which, accordingly, strengthens its relevance as a complex clinical and scientific problem. There is data on an increase in the incidence rate in all age groups of small animals.

The main reasons for this increase are related to changes in animal housing conditions, in particular the effects of stress and physical inactivity, deterioration of the ecological situation, changes in the quality of feed and drinking water, as well as other adverse factors.

CHAPTER 2

MATERIAL AND METHOD

2.1. Material of reaserch

Horsetail Extract

Equisetum arvense L.

Synonyms: Extractum Equiseti arvensis siccum, horsetail, common horsetail, field horsetail, Schachtelhalm, cola de caballo, marsh fir, horsetail, pine tree, pine needle, fir tree, peanuts, marsh column, fescue

Family: Equisetaceae

Parts of the plant used: grass, aerial part

Method of obtaining: extraction with organic solvents, evaporation and drying.

Characteristics:

Appearance: amorphous hygroscopic powder

Color: brown, greenish-gray

Odor: characteristic

Taste: bitter-sour

Solubility: soluble in water, alcohol

Silicon content: up to 10%

Molecular formula: H2O3Si

Molecular weight: 78.09

Chemical composition: flavonoids, alkaloids, phenolcarboxylic acids, carotene, silicic acid, tannins, organic (aliphatic) acids (citric, tartaric, malic), polysaccharides (arabinose and xylose), sesquiterpene lactones, tannin, saponin, chromium, manganese, iron, lead, copper, cobalt), resinous substances, vitamins (C), proteins, carbohydrates, fatty oils (3-3.5%), essential (essential) oil.

For the European chemotype of horsetail:

- silicic acid (up to 10%),
- flavonoids (quercetin, genkvanin, kaempferol derivatives, luteolin) (3.37%)
- phenolic glycosides
- triterpenoids
- polysaccharides (4.07%)
- gold (0.03-0.075 ppm)
- enzymes - silicases
- equisetin, traces of alkaloids of the nicotinic and spermidine series, palustrine (up to 0.26%)
- phytosterols: cholesterol, epicholestanol, 24-methylenecholesterol, isofucosterol (5.9%), campesterol (32.9%), β-sitosterol (60%), sitosterol.
- saponins (equisetin) (up to 5%)
- carotenoids;
- polyenoic acids;
- organic acids (aconic, arabinoic, glyceric, malic, malonic, fumaric, protocatechuic, quinic);
- Rhodoxanthin;
- vitamins (B and C)
- aliphatic acids (n-oxybenzoic, n-coumaric, protocatechuic, vanillin);

Action: draining, anti-inflammatory, anti-edematous, antipruritic, epithelizing, antifungal, diuretic, hemostatic, wound healing, disinfectant, astringent and antiseptic

Name:	**DRY EXTRACT OF ORDINARY SPOON**
International Nonproprietary Name:	Polygonum aviculare
Producer:	LLC "Pharmaceutical Company "Zdorovya", Kharkiv, Ukraine
Dosage form:	Substance
Release form:	Powder (substance) in polyethylene bags
Active ingredients:	Dry ergot extract
Indication:	Production of finished dosage forms.

Characteristic excipients

Syrup sugar simple – Syrup simplex

A thick, clear liquid with a sweet taste and no odor. It is obtained by boiling 16 parts of sugar in 9 parts of distilled water. It mixes very easily with water. It is a flavor enhancer for liquid dosage forms. It is used as auxiliary component at receiving as both solid and liquid dosage forms [12].

Water cleaned (Aqua purified) (SFU 2.0, 2 volume, WITH. 129)

Colorless, transparent, odorless liquid. Solvent in the preparation of various dosage forms

2.2. Methods research

The quality control of mixtures is carried out according to the following indicators: description, identification, ethyl alcohol concentration, impurity content, pH, density, container filling volume, quantitative content of active substances, heavy metals, microbiological purity [11].

To compile a description, the following organoleptic indicators are determined: color, transparency, smell, taste.

The color is determined by comparison with purified water, placing the sample and standard in transparent glass tubes, in diffused daylight, on a white background, viewed horizontally (SFU 2.2.2) [11].

Transparency determine, placing sample on dark background, in a test tube with a flat bottom of transparent colorless glass with an internal diameter of 15-25 mm, in diffused daylight, viewed vertically (SFU 2.2.1) [11].

pH is determined by the potentiometric method, measuring the potential difference between two electrodes — sensitive to ions hydrogen (usually a glass electrode) and a reference electrode (e.g. a calomel electrode) by with help voltmeter with incoming resistance not less than in 100 times greater than the input resistance of the electrodes and a sensitivity of at least 0.05 pH units, or 0.003 V (SFU 2.2.3) [11].

Conclusions to section 2

The objects of research are presented - dry extract of horsetail, dry extract of sedge, simple sugar syrup, purified water.

Organoleptic, physicochemical, and technological methods of research of the developed medicinal mixture are described. For assessments qualities cooked extemporaneous potions was Pharmacopoeial methods were used.

CHAPTER 3

DEVELOPMENT OF SCALADS AND TECHNOLOGY OF EXTEMPORAL MIXTURE

3.1. Analysis of herbal medicines for the treatment of urolithiasis in cats

In the management of large animals, phytotherapy is increasingly employed on organic farms as an alternative to minimize reliance on conventional allopathic drugs. These farms prioritize natural remedies such as herbal medicines derived from plant extracts and essential oils. Additionally, homeopathic products, nutraceuticals, and trace elements—like sodium, calcium, phosphorus, magnesium, and sulfur—are frequently administered to treat various animal health conditions. Synthetic allopathic drugs are considered only when these natural alternatives prove ineffective. In such cases, preference is given to rapidly metabolized drugs with minimal environmental impact and fewer adverse effects on the animal's system.

Table 3.1.

Main plants used in veterinary phytotherapy.

Scientific name	**Used parts**	**Use**	**Species**
Allium sativum	Cloves	Endoparasites	P; LA
Aloe faith	Latex	Skin diseases; Gastrointestinal diseases	LA
Arctostaphylos uva -ursi	Leaves	Urinary diseases	P
Artemisia spp.	Aerial parts	Gastrointestinal diseases; Endoparasites	P; LA
Oatmeal sativa	Aerial parts	Mastitis	LA
Calendula officinalis	Leaves; Flowers	Wounds; Gingivitis	P; LA
Capsella pastor's purse	Aerial parts	Hemorrhages, Reproductive disorders	LA
Carica papaya	Seeds; Latex	Endoparasites	P; LA

Chicory intybus	Aerial parts	Endoparasites	LA
Crataegus oxyacantha	Leaves; Flowers	Cardiotonic	P; LA
Cucurbita pepo	Seeds	Endoparasites	P
Cynara scolymus	Leaves	Hepatic diseases; Gastrointestinal spasms	P
Dorycnium spp.	Aerial parts	Endoparasites	LA
Echinacea spp.	Root; Aerial parts	Immunostimulant; Wounds	P; LA
Eucalyptus globule	Leaves; Essential oil	Ectoparasites; Respiratory diseases	P
Euphrasia officinalis	Aerial parts	Eye disease	P
Gentian yellow	Root	Gastrointestinal diseases	P
Glycyrrhiza glabra	Root	Gastrointestinal diseases; Otitis	P
Gossypium spp.	Leaves	Endoparasites	P
Hedera helix	Leaves	Placental retention	LA
Hypericum perforated	Flowers	Wounds	LA
Juniper common	Aerial parts; Oil	Skin diseases; Ectoparasites	P
Lavender officinalis	Essential oil; Stems	Ectoparasites; Wounds	LA
Lotus corniculatus	Aerial parts	Endoparasites	LA
Mallow sylvestris	Aerial parts	Immunomodulation; Respiratory diseases	P; LA
Matricaria chamomilla	Flowers	Eye Inflammation; Ear problems	P
Melissa officinalis	Leaves	Anxiety; Stress	P; LA
Mint pepper and *M.*	Leaves;	Ectoparasites and	P; LA

	Essential oil	Endoparasites	
cardifolia			
Onobrychis viciifolia	Aerial parts	Endoparasites	LA
Passionflower incarnate	Aerial parts	Anxiety; Hormonal imbalance	P ; LA
Plantago major	Leaves	Gastrointestinal diseases; Wounds	P; LA
Rose dog	Hip	Inflammation	P
Ruta graveolens	Leaves	Ectoparasites	LA
Salvia officinalis	Leaves; Flowers	Endoparasites; Dehydration	P; LA
Silybum marianum	Fruits	Hepatic diseases	P
Taraxacum officinalis	Root; Leaves	Gastrointestinal diseases	P; LA
Thymus common	Flowers	Respiratory and gastrointestinal diseases	P
Tilia cordata	Flowers	Respiratory diseases	P
Urticaria dioica	Seeds	Endoparasites; Diarrhea	LA
Valeriana officinalis	Root	Analgesic; Stress	P; LA
Ginger officinalis	Rhizomes	Vomiting	P

Table legend: P, pets; L.A., large animals.

Table 3. 2

Adverse reactions of some medicinal plants and plant products in domestic animals.

Scientific name	Adverse effects
Allium sativum	Antiplatelet effect; Hematology disorders
Artemisia absinthe	Convulsions
Echinacea spp.	Hepatotoxicity

Ephedra spp.	Hyperactivity, tremors, seizures, behavior changes, vomiting, tachycardia, hyperthermia
Juniper Sabina	Gastrointestinal and respiratory disorders; haemorrhages
Mint pepper	Hepatotoxicity
Rubus idaeus	Reproductive disorders

Herbal remedies commonly used in human medicine are also frequently used for pets, especially by owners familiar with these treatments for personal use. These natural therapies are applied to manage a range of health issues in companion animals, including respiratory problems, skin disorders, urinary tract issues, digestive disturbances, cardiovascular ailments, and stress reduction. Moreover, phytotherapy has gained traction in addressing chronic conditions as an alternative to prolonged use of synthetic drugs, which can sometimes cause adverse effects. In cases of severe illness, phytotherapy may also complement conventional treatment approaches.

Despite its growing popularity in veterinary care for pets, literature on the therapeutic application of phytomedicine in animals remains limited, with few comprehensive studies or clinical trials available. Data gathered from local veterinarians provide insights into the clinical use of specific plants and their derivatives for treating minor ailments. For instance, tinctures from Calendula officinalis, Centella asiatica, and Commiphora myrrha are helpful in managing gingivitis. Euphrasia officinalis is commonly used for conjunctivitis treatment. Remedies for diarrhea include chamomile infusion, carrot juice, or a 10% rice decoction. For respiratory ailments like cough, thyme (Thymus vulgaris) is recommended either as an essential oil (3 drops per body weight until remission) or as syrup (2 teaspoons thrice daily until remission). Furthermore, mother tinctures of lemon balm (Melissa officinalis), valerian (Valeriana officinalis), and hawthorn (Crataegus oxyacantha) are often prescribed at 1 drop per kilogram of body weight two to three times daily to alleviate anxiety and address stress-related behavioral or psychological issues in pets.

Research also highlights the medicinal potential of other plants commonly

used for gastrointestinal relief. Studies suggest that an infusion made from peppermint (Mentha piperita) and lemon balm (Melissa officinalis), given orally to dogs over two days, effectively addresses stomach and intestinal problems. Similarly, Aloe vera juice (3 mL orally), prepared by blending leaf gel with water, serves as a potent remedy for vomiting and gastric irritation. Ginger (Zingiber officinale) has demonstrated antiemetic properties in clinical studies; acetone and ethanolic extracts administered at doses of 100 mg/kg and 200 mg/kg respectively showed significant effects against nausea in dogs. Further studies have reinforced the use of ginger infusions for preventing nausea and vomiting in pregnant dogs.

Effective alternatives also exist for managing respiratory infections in dogs. Treatment with Echinacea powder over four weeks has been associated with noticeable improvement in symptoms such as nasal discharge, lymph node swelling, dry cough, breathing difficulty, and lung irritation. This suggests Echinacea's potential as a natural solution for canine upper respiratory tract infections.

Phytotherapy extends its benefits to controlling parasitic infestations in domestic animals. Using a topical spray made by mixing one to five drops (approximately 0.25 mL) of juniper (Juniperus communis) essential oil with water proves to be an effective flea repellent for dogs and cats. However, caution is warranted as oral ingestion of juniper can pose risks to pets. Meanwhile, chamomile (Matricaria chamomilla) has demonstrated acaricidal properties; a 10% decoction of its dried flower heads achieved complete eradication of Psoroptes cuniculi mites in vitro, which are responsible for otoacariiasis in domestic animals. Consequently, chamomile is often recommended for addressing ear-related issues.

Phytotherapeutic practices continue to expand within veterinary medicine for both companion and farm animals, offering sustainable and low-risk alternatives while reducing reliance on synthetic drugs. Although further research is needed to fully validate these treatments, the integration of plant-based remedies marks promising progress in animal health care.

Although relatively few studies have assessed the therapeutic efficacy of herbal remedies in companion animals, a significant body of literature addresses the

use of plants and plant-derived substances in the treatment and management of farm animals. In several regions of Italy, farmers frequently use a variety of plants, including Brassica oleracea, Avena sativa, Anagallis arvensis, Linum usitatissimum, Scrophularia canina, and Buxus sempervirens, for the prevention and treatment of mastitis in cattle. These plants are valued for their anti-inflammatory and emollient properties.

An in vivo study highlighted the effects of Echinacea extracts administered to horses over 42 days. The treatment not only bolstered the immune system—evidenced by increased phagocytic activity of isolated neutrophils, higher peripheral lymphocyte counts, and enhanced neutrophil migration into tissues—but also improved blood quality by increasing hemoglobin concentration and erythrocyte counts. Given these impacts on oxygen transport mechanisms, Echinacea spp. may hold potential for optimizing exercise physiology and performance.

Research by Peeters et al. examined a commercial herbal product containing Valeriana officinalis and Passiflora incarnata, suggesting its sedative and anti-anxiety benefits for pigs during transport stress. Administering 2.5 g/L of the herbal product via drinking water over two days significantly mitigated stress-induced cardiovascular changes, such as reduced spikes in minimum heart rate, ventricular ectopic beats, and ST elevation, when compared to a control group.

Various plants are also used to manage anxiety in domestic animals, particularly in horses. For instance, magnolia leaves (Magnolia acuminata) and passion flower blossoms (Passiflora incarnata) are commonly used for their calming properties. Alternatively, other plant-based options continue to be explored.

The majority of studies reviewed in the literature emphasize the anti-parasitic properties of various plant species, including Allium sativum, Anethum graveolens, Eucalyptus globulus, Mentha piperita, Lavandula officinalis, and specific forages commonly utilized in livestock management, particularly in ruminants. These effects are largely attributed to the presence of essential oils, secondary metabolites, and bioactive compounds such as terpenes, alkaloids, glycosides, and tannins contained within these medicinal plants.

A substantial body of research has investigated and reviewed the use of medicinal plants, plant-derived extracts, and related botanical products for managing parasitism in domestic animals. For instance, extracts of Artemisia absinthium administered orally at a dosage of 2 g/kg body weight have demonstrated remarkable efficacy as a natural anthelmintic agent against gastrointestinal nematodes in sheep, leading to a significant reduction in fecal egg counts. The active ingredient responsible for this effect is santonin, a sesquiterpene lactone with selective toxicity against nematodes. Similarly, oral administration of papaya latex (Carica papaya) at a dosage of 8 g/kg body weight in pigs naturally infected with *Ascaris suum* effectively reduced the parasitic burden by up to 100% within seven days post-treatment. In addition to these examples, several forages, including sulla (Hedysarum coronarium), chicory (Cichorium intybus), alfalfa (Medicago sativa), and lotus major (Lotus pedunculatus), exhibit anti-parasitic properties. These effects are believed to arise from their content of tannins and other bioactive secondary metabolites. Specifically, Marley et al. reported that lambs naturally infected with helminth parasites exhibited a significantly reduced parasitic burden after grazing on forages such as birdsfoot trefoil (Lotus corniculatus) and chicory for five weeks compared to sheep grazing on standard forages such as Lolium perenne and Trifolium repens.

Horsetail extract is an unusual and even misleading name for a botanical product at first glance. However, it should not be confused with anything related to horses. This compound is obtained from several species of the genus Equisetum, the most common of which is Equisetum arvense. The Latin origin of the genus name — from the words equus (horse) and seta (bristle) — is explained by the appearance of the plant. During the drying process, silica crystals accumulate in its stems and branches, giving the surface a rough structure similar to feathery horsetails. In medical practices, only the above-ground parts of this plant (freshly prepared or dried) are used. The raw materials are processed into capsules, tinctures, teas and other dosage forms.

Horsetail extract is obtained from the stems of Equisetum arvense, also known as field horsetail. This species belongs to the class Equisetaceae, which is part of the fern family. Interestingly, representatives of this genus appeared in the Paleozoic era; in ancient times, their ancestors reached a height of over 27 meters. The name horsetail was established due to the external similarity of branched shoots to a horse's tail and mane. Modern researchers have repeatedly noted the double symbolism of this name - it refers to both the visual characteristics of the plant and its beneficial properties, in particular for strengthening hair. Horsetail extract is a natural product that is valued for its health-improving properties.

Throughout history, horsetail has been an integral part of folk medicine in various cultures. Horsetail not only plays an important role in herbal medicine, but also offers a wide range of applications beyond restoring hair health. This species is traditionally used to reduce fluid retention in the body, support kidney and bladder function, prevent the formation of urinary stones, and prevent urinary tract infections. Phytotherapists have also used it to treat joint diseases, osteoporosis, gout, and to alleviate frostbite. When applied externally, horsetail preparations accelerate wound healing and soothe burns. Interestingly, ancient Roman doctors were not limited to the pharmacological properties of this plant: Equisetum arvense was considered a nutritious food product. Even today, dishes made from young horsetail shoots can be found in Japanese cuisine. Due to its natural origin and wide benefits, the plant remains a unique component in both medical practices and culinary traditions.

The value of horsetail extract has been known since antiquity: it is mentioned in the descriptions of Greek and Roman doctors. Horsetail is a representative of an ancient class of plants, often called a “living fossil” due to its age of over one hundred million years. Over the years, this plant has accumulated genetic information and evolutionary adaptations, allowing its properties to remain relevant for therapeutic use to this day.

3.2. Justification warehouse extemporaneous potions

As already noted , plant raw materials are mostly used for the preparation of infusions , decoctions or extracts , which belong to liquid dosage forms. In in this context , based on plant raw materials in the conditions of a pharmacy are the most rational and economically profitable is the preparation of liquids of medicinal forms , such as as a mixture.

Mixtures characteristics low advantage , among which should be washed separately such as:

1. High speed of pharmacological action. Mixtures act faster compared to tablets or powders , since they do not require additional dissolution after administration into the body.

2. Possibility of organoleptic correction properties. This aspect is extremely important, considering that plant extracts often have an unpleasant taste .

3. Relative simplicity of the technological process and possibility flexible dosing and concentration changes by adjusting the amount of solvent under cooking time .

4. Ease of use . At the same time It is also worth noting the key disadvantage of liquid medicines forms, namely, their susceptibility to microbial contamination, which makes long -term storage difficult.

With the subject to prevent overcrowding In this case , preservatives or alcohol - containing components may be included in the composition of the mixtures . once and with seasoning and flavoring , with o kre m a p ro s t y m cheese cheese . According to with your requirements State Pharmacists In the country (SFU), mixtures are determined like liquid medicine forms for internal use, which can be presented in the form of solid solutions, finely dispersed suspensions or emulsions . They are dosed accordingly volume of a tablespoon (15 ml), dessert spoon (10 ml) or teaspoon (5 ml). The composition of the mixtures may include infusions, decoctions, extracts, as well as soluble and insoluble powders. In within internal pharmacy solution production with with a s that s ov es " Simple cheese " (lat. *Syrup simplex*), What to be able to 64% sugar.

This form of syrup there is no only correspondent taste , but it is also possible to use cavia with and for improvement organoleptic properties of the finished mixture, ensuring its acceptability for patients .

Dry extract of Polygonum aviculare has a wide range of pharmacological properties, including diuretic, anti-inflammatory, antibacterial and antifungal effects. It also improves metabolism, restores water-salt balance, has a tonic effect, reduces vascular permeability, increases blood clotting and has a hemostatic effect.

More about the pharmacological action:

Diuretic action:

Sporish increases urine output, which helps with urolithiasis, edema, and other kidney diseases.

Anti-inflammatory effect:

Relieves inflammation and skin irritation, soothes and heals wounds.

Antibacterial action:

Helps fight acne, pimples and other infectious skin lesions.

Antifungal action:

Able to fight some types of fungal infections.

Improving metabolism:

Strengthens the body and normalizes the functioning of internal organs.

Water and salt balance:

Restores the balance of fluids and electrolytes in the body.

Toning effect:

Increases body tone and overall strength.

Decreased vascular permeability:

Reduces the likelihood of bleeding and improves blood circulation.

Blood clotting:

Increases the blood's ability to clot, which helps with bleeding.

Hemostatic effect:

Stops bleeding and prevents its recurrence.

Application:

Dry extract of spore can be used in the form of infusions, decoctions and cosmetics. It is used for urolithiasis, kidney diseases, inflammatory processes, circulatory problems, as well as in cosmetology for skin and hair care.

Polygonum aviculare is a plant that has medicinal properties and is used in folk medicine. Here is a list of preparations containing Polygonum aviculare:

1. Tincture of sedge

- **Form** : Alcohol-based liquid tincture.
- **Usage** : Used to treat urinary tract diseases, as well as as a general tonic.

2. Broth of spore

- **Ingredients** : Dry leaves or grass of the sedge.
- **Preparation** : Pour boiling water over, let it steep and strain.
- **Uses** : Used to treat inflammatory processes, as well as to improve digestion.

3. Spiraea tea

- **Ingredients** : Dry sedge (leaves or grass).
- **Usage** : For general strengthening of the body, has a diuretic effect.

4. Capsules or tablets with spore

- **Example** : dietary supplements based on spore.
- **Uses** : To support urinary system health and strengthen immunity.

5. Homeopathic preparations with ergot

- **Form** : Various forms (tablets, drops).
- **Usage** : For comprehensive treatment and support of the body.

6. Ointments and creams with ergot extract

- **Usage** : For external use for skin diseases, inflammations, and for wound healing.

Useful properties of spore

- **Diuretic effect** : Helps remove excess fluid from the body.
- **Anti-inflammatory properties** : Used to treat inflammation.
- **Vitaminization** : Rich in vitamins and trace elements.

It is recommended to consult a doctor before using ergot preparations, especially if you are taking other medications or have chronic conditions.

Horsetail dry extract has a wide range of pharmacological effects, including diuretic, anti-inflammatory, antioxidant, hemostatic, and antimicrobial effects. It helps eliminate toxins and waste from the body, and can also be useful for various health problems.

More information about the pharmacological effects of dry horsetail extract:

- **Diuretic:**

Horsetail extract stimulates the production and excretion of urine, which helps cleanse the body of excess fluid and toxins.

- **Anti-inflammatory:**

The active components of the extract help reduce inflammation in the body.

- **Antioxidant:**

The extract contains substances that protect cells from damage by free radicals.

- **Hemostatic:**

The extract may be useful in stopping bleeding.

- **Antimicrobial:**

The extract has antibacterial and antimicrobial properties.

- **Improves metabolism:**

The extract can help to better regulate metabolism in the body.

- **Strengthens blood vessels:**

The extract helps strengthen capillaries and blood vessels.

- **Lead removal:**

The extract helps remove heavy metals from the body.

- **Improves bone health:**

Studies show that the extract may help improve bone density, which may be beneficial for osteoporosis.

- **Heals wounds and burns:**

The extract can help heal wounds and burns due to its antiseptic properties.

Field horsetail (Equisetum arvense)

Form: Dry extract, tincture, tea.

Uses: To strengthen hair, skin, and as a diuretic.

2. Horsetail in capsules

Example: horsetail-based dietary supplement.

Uses: To support joint health and improve metabolism.

3. Horsetail in tablets

Example: Preparations containing horsetail to strengthen nails and hair.

Use: Prevention and treatment of micronutrient deficiencies.

4. Horsetail tincture

Form: Alcohol-based liquid tincture.

Use: External application to strengthen skin and hair.

5. Horsetail decoction

Form: Dry horsetail for making a decoction.

Use: Internal use for the treatment of genitourinary diseases.

6. Creams and ointments with horsetail extract

Example: Skin creams with horsetail.

Use: For the treatment of skin diseases (eczema, dermatitis).

7. Horsetail tea

Ingredients: Dry horsetail.

Usage: For general strengthening of the body, as a diuretic.

8. Homeopathic remedies with horsetail

Form: Various forms (tablets, drops).

Usage: For comprehensive treatment and support of the body.

It is recommended to consult a doctor or pharmacist before using these medications to avoid possible side effects and interactions with other medications.

Since sugar syrup is a preservative and flavor enhancer at the same time, and the dosage form itself is positioned as “natural” as possible, that is, without

unnecessary impurities of unnatural origin, it would be inappropriate to introduce flavor enhancers, odor enhancers, and preservatives.

Thus, the total composition of the drug per 100 g will be: Active ingredients:

Sporish dry extract — 8.0 g

Horsetail dry extract — 12.0 g

Excipients:

Simple sugar syrup — 20.0 ml

Purified water up to 100 ml

3.3. Development rational technology potions for preparation at pharmacies conditions

The preparation of an extemporaneous mixture will consist of the following steps:

1. Dissolution dry extracts.

Since the dry components in The composition of the mixture consists of more than 3%, to calculate the amount of purified water, the coefficients of increase in the volume of the aqueous solution when dissolving dry extracts are taken into account.

Waters purified = 100 – (0.61 * 8.0 + 0.60 * 12.0) – 20 = 68 ml.

In an auxiliary container, 8.0 g of dry extract of sedge grass and 12.0 g of dry extract of horsetail grass are sequentially dissolved in purified water (taking into account the CW of dry components) and mixed thoroughly until the extracts are completely dissolved [6].

2. Filtering.

Filter the resulting solution through long-fiber cotton wool and a double layer of gauze into a dispensing container.

3. Introduction liquid components.

Add 20 ml of syrup to the dispensing container with the strained solution. simple.

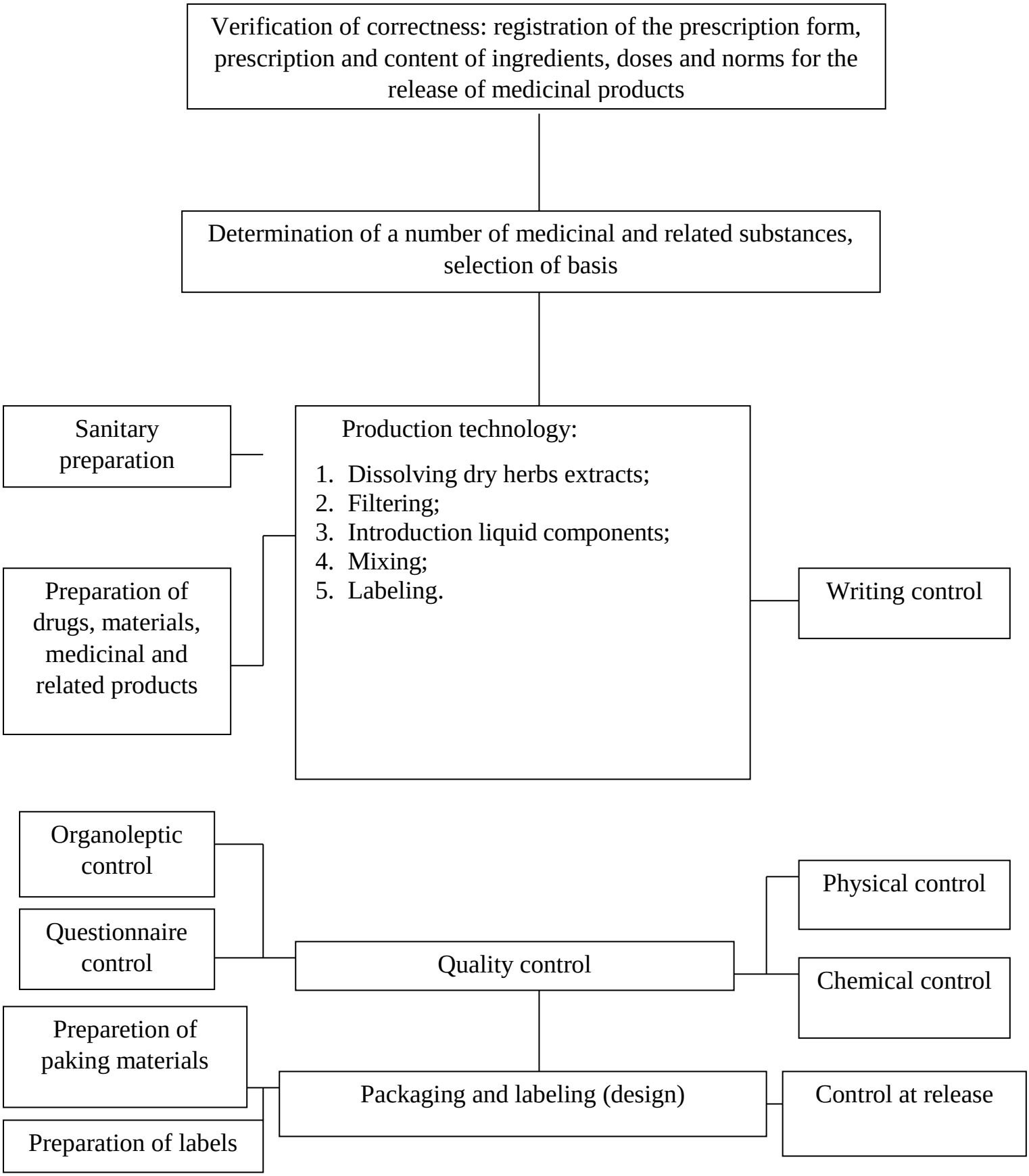
4. Mixing potions.

The dispensing container is sealed with a stopper and a lid, and shaken vigorously to mix the components of the mixture.

It is dispensed in dark glass bottles with polyethylene stoppers and screw caps.

They stick labels "Mixture", "save in cool and dark place", "Shake before use", "Keep out of reach of children".

Based on the research results, a technological scheme for preparing extemporaneous mixtures in pharmacy production conditions has been proposed (Fig. 3.1).



Pic. 3.1. **T**echnological scheme for preparing extemporaneous mixtures in pharmacy production

3.4 Control qualities received potions by organoleptic and physicochemical indicators

Received solution there are opalescent transparent mixture brown color, specific spicy smell and sweetish taste.

pH is determined by potentiometric method (SFU 2.2.3). The results of the research are given in Table 3.5

Table 3.5

Definition pH potions

Number series	*Indicator*
0001	4.9±0.01
0002	5.2±0.01
0003	5.1±0.01
0004	4.9±0.01
0005	5.2±0.01

In result conducted research installed norm for this indicator is within 4.9 - 5.2.

Relative density determine pycnometer by method 1 State Pharmacopeia 2.2.5.

Results given in table 3.6

Table 3.6

Definition relative densities potions

Number series	*Indicator*
0001	1.125±0.01
0002	1.135±0.01
0003	1.121±0.01
0004	1.148±0.01
0005	1.138±0.01

In result conducted research installed norm for this indicator within 1.121 - 1.148 g/cm ^{3}

The refractive index was determined according to the method of the State Pharmacopeia, 2.2.6 - using a refractometer. The measurement results in five experimental samples are presented in Table 3.7.

Table 3.7

Definition indicator refraction potions

Number series	*Indicator*
0001	1.452±0.01
0002	1.450±0.01
0003	1.452±0.01
0004	1.449±0.01
0005	1.451±0.01

As a result of the conducted research, the norm for this indicator was established as not lower than 1.449.

Heavy metal impurities are tested by method A of the State Physical and Chemical Institute of Ukraine 2.4.8. The color of the mixture sample should not be more intense than the color of the standard.

Thus, we have developed indicators for quality control of medicinal mixtures (Table 3.9).

Table 3.9

Indicators control qualities medical potions

Indicators	*Methods*	*Norms*
Appearance	Visual, State Federal University, 2.2.1, 2.2.2	Opalescent transparent mixture brown colors, with a specific smell and sweetish taste.
Homogeneity	Visual, State Federal University, 2.2.1, 2.2.2	Homogeneous solution
Impurities heavy metals	method AND State Federal University 2.4.8.	Color not more intense standard

Relative density	State Federal University, 2.2.5	1,121 — 1,148 g/cm ^{3}
pH	State Federal University, 2.2.3	4.9 — 5.2
Refractive index	State Federal University, 2.2.6	not lower 1,449
Volume filling container	State University of Finance and Economics 2.0	97 — 103 ml
Storage conditions		IN dark, dry place

Conclusions to section 3

A review of herbal medicinal raw materials was conducted, its identification features, its chemical composition and application were presented, samples of preparations from this raw material and their application were presented.

The technology for preparing the dosage form has been developed, its composition and technological scheme for preparation are given.

General composition drug on 100 g will be draw up:

Active ingredients:

- Spore grass extract dry — 8 .0 g.
- Horsetail grass extract dry — 1 2 .0 g.

Excipients:

- Syrup sugar simple — 20.0 g.
- Water cleaned to 100 ml

Characteristics and indicators are defined and presented of the resulting dosage form.

Conducted relevant trial on conformity requirements State Federal University.

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Ф А 2.2.1–32-366

National University of Pharmacy

Faculty pharmaceutical
Department drug technology
Level of higher education master
Specialty 226 Pharmacy, industrial pharmacy
Educational and professional program Pharmacy

APPROVED
The Head of Department

_____
Liliia VYSHNEVSKA

"30" August 2024

ASSIGNMENT
FOR QUALIFICATION WORK
OF AN APPLICANT FOR HIGHER EDUCATION

Malak ZAMAKHASHARI

1. Topic of qualification work: « DEVELOPMENT OF THE COMPOSITION OF VETERINARY DROP FOR THE TREATMENT AND PREVENTION OF CAT UROLITHIASIS », supervisor of qualification work: Marina BURYAK, associate professor of higher education institution of department pharmaceutical drugs technology, PhD,
approved by order of NUPh from "27" of September 2024 № 237

2. Deadline for submission of qualification work by the applicant for higher education: May 2025.

3. Outgoing data for qualification work: veterinary technology, cats, urolithiasis, pharmaceutical technology, composition, contents of the settlement and explanatory note (list of questions that need to be developedanalyze and summarize modern literary data on the current state of treatment of cats urolitiasis; conduct an analysis of the extemporaneous formulation of mixture for the treatment of utotiliasus; to theoretically and experimentally justify the composition of extemporaneous mixture on plant raw materials;

4. List of graphic material (with exact indication of the required drawings): tables 5, pictures 8.

5. Consultants of chapters of qualification work

Chapters	Name, SURNAME, position of consultant	Signature, date	
		assignment was issued	assignment was received
1	Marina BURYAK, assistant professor of higher education institution of department Pharmaceutical Technology of Drugs	05.09.2024	05.09.2024
2	Marina BURYAK, assistant professor of higher education institution of department Pharmaceutical Technology of Drugs	01.11.2024	01.11.2024
3	Marina BURYAK, assistant professor of higher education institution of department Pharmaceutical Technology of Drugs	11.02.2025	11.02.2025

6. Date of issue of the assignment: "30" August 2024

CALENDAR PLAN

№ з/п	Name of stages of qualification work	Deadline for the stages of qualification work	Notes
1	Justification of the research design	September 2024	**done**
2	Analysis of literature sources	October-November 2024	**done**
3	Conducting experimental research	November-December 2024	**done**
4	Analysis, interpretation, and synthesis of the results	January-March 2025	**done**
5	Designing a work	April 2025	**done**

An applicant of higher education _____ Malak ZAMAKHASHARI

Supervisor of qualification work _____ Marina BURYAK

ВИТЯГ З НАКАЗУ № 237

По Національному фармацевтичному університету

від 27 вересня 2024 року

Затвердити теми кваліфікаційних робіт здобувачам вищої освіти 5-го курсу Фм20(4,10д) 2024-2025 навчального року, освітньо-професійної програми – Фармація, другого (магістерського) рівня вищої освіти, спеціальності 226 – Фармація, промислова фармація, галузь знань 22 Охорона здоров'я, денна форма здобуття освіти (термін навчання 4 роки 10 місяців), які навчаються за контрактом (мова навчання англійська та українська) згідно з додатком № 1.

Прізвище, ім'я здобувача вищої освіти	Тема кваліфікаційної роботи		Посада, прізвище та ініціали керівника	Рецензент кваліфікаційної роботи
• **по кафедрі аптечної технології ліків**				
Замахшарі Малак	Розроблення складу ветеринарних крапель для лікування та профілактики сечокам'яної хвороби котів	Development of the composition of veterinary drop for the treatment and prevention of cat urolithiasis	доц. Буряк М.В.	проф. Сліпченко Г.Д.

Ректор

Вірна: Секретар

ФА2.8-03-317

ВИСНОВОК

експертної комісії про проведену експертизу
щодо академічного плагіату у кваліфікаційній роботі

здобувача вищої освіти

«05» травня 2025 р. № 331178654

Проаналізувавши кваліфікаційну роботу здобувача вищої освіти Діпай Фадуа, групи Фм20(4.10д)англ-01, спеціальності 226 Фармація, промислова фармація, освітньої програми «Фармація» навчання на тему: « Розроблення складу ветеринарних крапель для лікування та профілактики сечокам'яної хвороби котів / Development of the composition of veterinary drop for the treatment and prevention of cat urolithiasis», експертна комісія дійшла висновку, що робота, представлена до Екзаменаційної комісії для захисту, виконана самостійно і не містить елементів академічного плагіату (компіляції).

Голова комісії,
проректор ЗВО з НПР,
професор **Інна ВЛАДИМИРОВА**

Ф А 2.2.1-32-353

REVIEW

of scientific supervisor for the qualification work of the master's level of higher education of the specialty 226 Pharmacy, industrial pharmacy

Malak ZAMAKHASHARI

on the topic: «Development of the composition of veterinary drop for the treatment and prevention of cat urolithiasis»

Relevance of the topic. Recently, veterinarians in Ukraine and abroad have been paying significant attention to small domestic animals, such as cats, dogs, rodents and various exotic species, in particular, to providing them with the necessary veterinary care. One of the most pressing problems in the field of veterinary nephrology is urolithiasis, or urolithiasis in cats. This pathology occupies a leading place in the structure of diseases of the genitourinary system among cats in terms of the frequency of diagnosis and the number of deaths. It is placed on the same level as cardiovascular diseases, oncological pathologies and traumatic injuries. The causes and mechanisms of urinary stone formation are still not fully understood.

Practical value of conclusions, recommendations and their validity. The approaches proposed by the acquirer to the development of the optimal composition of extemporaneous mixture can be used in the production process of pharmacies in the production of soft dosage forms.

Assessment of work. The qualification work in terms of theoretical and practical research fully meets the requirements for qualification works.

General conclusion and recommendations on admission to defend. Malak ZAMAKHASHARI qualification work can be submitted for defense to the Examination Commission of the National Pharmaceutical University for the assignment of the educational qualification level of Master of Pharmacy.

Scientific supervisor _____ Marina BURYAK

«15» of May 2025

Ф А 2.2.1-32-356

REVIEW

for qualification work of the master's level of higher education, specialty 226 Pharmacy, industrial pharmacy

Malak ZAMAKHASHARI

on the topic: «Development of the composition of veterinary drop for the treatment and prevention of cat urolithiasis»

Relevance of the topic. However, under certain circumstances, these processes are disrupted, which leads to the formation of stones in the kidneys and urinary tract. Statistics show that more than 50% of domestic cats over three years old face this problem, and neutered animals often show changes in the functioning of the renal system.

Diagnosis of urolithiasis is based on the study of morphological and biochemical parameters of the blood, which indicate metabolic disorders, as well as urine tests. In addition, treatment and prevention programs are used, which include etiotropic, symptomatic, rehydration, replacement and rehabilitation therapy.

Modern methods of treatment and prevention of urolithiasis in cats are often insufficiently effective and do not always meet the expected results. In the scientific literature on veterinary medicine, data on the seasonal dynamics of the disease, age, breed, sex and species-specific aspects of urolithiasis are not sufficiently described. There is also a lack of detailed materials on differential diagnosis and the development of complex therapeutic approaches in the treatment of this pathology.

Theoretical level of work. The work carried out by the acquirer on the analysis of literature data on the researched issue is thorough and systematized.

Author's suggestions on the research topic. Based on the analysis of literature data and the conducted experiment, the author proposed the optimal composition of the dosage form.

Practical value of conclusions, recommendations and their validity. The results of the work can be used in the production process of pharmacies in the production of soft dosage forms.

Disadvantages of work. The work contains unsuccessful expressions, spelling and grammatical errors, incompleteness of conclusions.

General conclusion and assessment of the work. Malak ZAMAKHASHARI qualification work can be submitted for defense to the Examination Commission of the National Pharmaceutical University for the assignment of the educational qualification level of Master of Pharmacy.

Reviewer _____ prof. Galina SLIPCHENKO

«16» of May 2025

Ф А2.2.1-91-287

МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
НАЦІОНАЛЬНИЙ ФАРМАЦЕВТИЧНИЙ УНІВЕРСИТЕТ

ВИТЯГ З ПРОТОКОЛУ № 17
«19» травня 2025 року
м. Харків
засідання кафедри
аптечної технології ліків
(назва кафедри)

Голова: завідувачка кафедри, професор Вишневська Л.І.
Секретар: докт. філ., ас. Боднар Л.А.

ПРИСУТНІ:

проф. Половко Н.П., проф. Семченко К.В., проф. Зуйкіна С.С., доц. Ковальова Т.М., доц. Буряк М.В., доц. Ковальов В.В., доц. Олійник С.В., доц. Марченко М.В., ас. Іванюк О.І.

ПОРЯДОК ДЕННИЙ:

1. Про представлення до захисту кваліфікаційних робіт здобувачів вищої освіти.

СЛУХАЛИ: проф. Вишневську Л. І. – про представлення до захисту до Екзаменаційної комісії кваліфікаційних робіт здобувачів вищої освіти.

ВИСТУПИЛИ: Здобувач вищої освіти групи Phm20(4,10d)eng-01 спеціальності 226 «Фармація, промислова фармація» Malak ZAMAKHASHARI – з доповіддю на тему «Development of the composition of veterinary drop for the treatment and prevention of cat urolithiasis» (науковий керівник, доц. Марина БУРЯК).

УХВАЛИЛИ: Рекомендувати до захисту кваліфікаційну роботу.

Голова
Завідувачка кафедри, проф. _____ Лілія ВИШНЕВСЬКА
(підпис)

Секретар
Асистент _____ Любов БОДНАР
(підпис)

Ф А2.2.1-32-042

НАЦІОНАЛЬНИЙ ФАРМАЦЕВТИЧНИЙ УНІВЕРСИТЕТ

ПОДАННЯ
ГОЛОВІ ЕКЗАМЕНАЦІЙНОЇ КОМІСІЇ
ЩОДО ЗАХИСТУ КВАЛІФІКАЦІЙНОЇ РОБОТИ

Направляється здобувач вищої освіти Malak ZAMAKHASHARI до захисту кваліфікаційної роботи
за галуззю знань 22 Охорона здоров'я
спеціальністю 226 Фармація, промислова фармація
освітньо-професійною програмою Фармація
на тему: « Development of the composition of veterinary drop for the treatment and prevention of cat urolithiasis»

Кваліфікаційна робота і рецензія додаються.

Декан факультету _____/ Микола ГОЛІК /

Висновок керівника кваліфікаційної роботи

Здобувач вищої освіти Malak ZAMAKHASHARI представила кваліфікаційну роботу, яка за об'ємом теоретичних та практичних досліджень повністю відповідає вимогам до оформлення кваліфікаційних робіт.

Керівник кваліфікаційної роботи

_____ Марина БУРЯК

«15» травня 2025 р.

Висновок кафедри про кваліфікаційну роботу

Кваліфікаційну роботу розглянуто. Здобувач вищої освіти Malak ZAMAKHASHARI допускається до захисту даної кваліфікаційної роботи в Екзаменаційній комісії.

Завідувачка кафедри
аптечної технології ліків

_____ Лілія ВИШНЕВСЬКА

«19» травня 2025 р.

Qualification work was defended
of Examination commission on
« 16_» of June 2025
with the grade _____ Head of the State
Examination commission, Doctor of
Pharmaceutical Sciences, Professor

_____/ Volodymyr YAKOVENKO /