TVET CERTIFICATE III in ANIMAL HEALTH

WORKPLACE PREPARATION FORVETERINARY INTERVENTION

ANHPW302

Prepare workplace for veterinary intervention

Competence

REQF Level: 3

Credits: 8

Learning hours 80

Sector: Agriculture and Food processing

Sub-sector: Animal health

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Purpose statement

This module covers the knowledge, skills and attitudes required to prepare workplace for veterinary intervention. Indeed, any veterinary activity involves a proper preparation of workplace. So this competence is very important for the Veterinary assistant training and it is a prerequisite for all the specific modules of the qualification involving the manipulation and treatment of the different animal species. Upon completion of this module, the trainee will be able to:

- Identify and store veterinary drugs according to their therapeutic function;
- Identify and store veterinary instruments and equipment according to their intended use;
- Clean and sanitize workplace, instruments and equipment;

Perform proper waste disposal.

Table of content

	Elements of competence and performance criteria	
Learning Unit	Performance Criteria	**Page Nº**
LU1: Store veterinary drugs according to their therapeutic function	1.1-Identify and select forms of veterinary drugs	**3**
	1.3-Identify and select veterinary drugs acting on different systems	
	1.4-Arrange veterinary drugs	
Learning unit 2: Store veterinary instruments and equipment	**2.1 Identify and select common veterinary materials, tools and equipment.**	**30**
	2.2: Arrange materials and tools equipment	
	2.3 Store the materials tools and equipment	
Learning unit 3: Clean and sanitize workplace, instruments and equipment	**3.1: Identify and select of cleaning materials, tools and equipment**	**48**
	3.2: Clean and sanitize the workplace materials tools and equipment	
	3.3. Clean the floors, benches and other flat areas	
	3.4: Clean the livestock shelters	
	3.5: Perform waste disposal	
	3.6: Store cleaning/sanitizing equipment, tools and chemicals	

LU1: Store veterinary drugs according to their therapeutic function

1.1 Identify and select forms of veterinary drugs

Topic 1: Definition of terminologies:

a. **Pharmacology**: The science and study of drugs, including the chemistry and biological effects
b. Pharmacy:

1. The art, practice, or profession of preparing, preserving, compounding, and dispensing medical drugs

2. A place where drugs are compounded or dispensed.

c. **Pharmacodynamics:** The science and study of how drugs produce their effects
d. **Pharmacokinetic**: The study of the route medications take in the body. How they are absorbed, transformed, distributed, metabolized, and eliminated
e. **Pharmacognosy**: Deals with the nature and sources of natural drugs obtained from plants or animals, either directly or indirectly
f. **Drugs**: A chemical used in the diagnosis, treatment, or prevention of disease.
g. **Poisons**: a substance that through its chemical action usually kills, injures, or impairs an organism
h. **Antiseptic**: A substance that inhibits the proliferation of infectious microorganisms.
i. **Toxicology**: the study of the conditions (including dose) under which exposure of living systems to chemicals is hazardous.
j. **Poisoning**: Poisoning is a condition or a process in which an organism becomes chemically harmed severely (poisoned) by a toxic substance or venom of an animal

Topic 2: Drug names

Drug nomenclature is the systematic naming of drugs, especially pharmaceutical drugs. In the majority of circumstances, drugs have 3 types of names: chemical names, generic or nonproprietary names and trade names, which are brand names.

a. **Chemical name**: The chemical names are the scientific names, based on the molecular structure of the drug. Chemical names are typically very long and too complex to be commonly used in referring to a drug in speech or in prose documents.
Eg: 1-(isopropylamino)-3-(1-naphthyloxy) propan-2-ol" is a chemical name for propranolol.

b. **Generic/nonproprietary:** is more concise name given to the specific chemical compound. The nonproprietary names are usually listed as active ingredient on drug labels and can be found on the drug label for many different drug manufacturers.

   - **Example:** Amoxicillin

c. **Trade name**: is a unique name a manufacturer gives its particularly brand of drug, because the trade names are proper nouns they are capitalized. The names are followed by the marks ® or ™ to signify that the trade name is registered trademark and cannot be legally used by other manufacturers.

Example: Amoxi-Drop®, Biomox®, Robamox-V®

Topic 3: Composition of a drug

A form of a drug is traditionally composed by: active ingredient, excipient adjuvant and additives.

a. **Active ingredient**: Any substance or combination of substances used in a finished pharmaceutical product (FPP), intended to furnish pharmacological activity or to otherwise have direct effect in the diagnosis, cure, mitigation, treatment or prevention of disease, or to have direct effect in restoring, correcting or modifying physiological functions in human beings."

b. **Excipient**: A more or less inert substance added in a prescription as a diluent or vehicle or to give form or consistency when the remedy is given in pill form; e.g., simple syrup, vegetable gums, aromatic powder, honey, and various elixirs.

c. **Adjuvant**: it is a substance that aids another, such as an auxiliary remedy

d. **Additive**: A substance added in small amounts to somethinglse to improve, strengthen, or otherwisealterit.Additivesareusedforavarietyofreasons.Theyareaddedtofood,forexample,toenhance tasteor color to prevent spoilage

Topic 4: Drugs forms (physical appearance/presentation or type)

A. Solid forms:

i. Powders: Powder is the most common solid form; most drugs can be dried and divided into portions that can be used in internal and external applications

ii. Bolus: Boluses are large elongated tablets intended for administration to animals

iii. Tablets /caplets: Tablets are another popular solid form of drug delivery. In this form the drug is mixed with various other ingredients such as binders, diluents and lubricants that enable the material to be molded and compressed into the desired shape

iv. crystals,

v. Capsules /gel caps: made from gelatin or a non-animal substitute. Capsules may contain dry materials, oil or liquid ingredients. The thin capsule material dissolves fast enabling the drug to be absorbed quickly by the body

B. Liquid and injectable forms:

i. Solutions: A solution is a liquid preparation that contains one or more dissolved chemical substances in a suitable solvent or mixture of mutually miscible solvents.

ii. Suspensions: A suspension is a biphasic preparation consisting of solid particles dispersed throughout a liquid phase

iii. Liniments: a liquid or semiliquid preparation for rubbing on or applying to the skin

C. Semi solid and semi liquid forms:

i. Ointments: are semisolid preparations intended for external application to the skin or mucous membranes.

ii. Pastes: Pastes are semisolid dosage forms that contain one or more drug substances intended for topical application
iii. Gels: Gels are quasi-solid materials that have a large number of cross-linked molecules usually holding aqueous solutions of the active pharmaceutical ingredient. Gels are commonly used for topical application as ointments or lotions
iv. candles,
v. Pencils
vi. Creams: an emulsion dosage form often containing more than 20% water and volatiles or containing lessthan 50% hydrocarbons, waxes, or polyols as the vehicle for the active pharmaceutical ingredients (API).

D. Other forms:

i. **Gaseous:** These devices contain drugs and are administered by inhaling the vapour sent out from the inhalant and directly to the patient's nasal passage

ii. **Spray:** attribute that describes the generation of droplets of a liquid or solution to facilitate application to the intended area

iii. **Pessary:** a small soluble block that is inserted into the vagina to treat infection or as a contraceptive.

1.2 Identify and select of veterinary drugs according to their therapeutic functions.

Topic 1: Drugs classification:

A drug may be classified by the chemical type of the active ingredient or by the way it is used to treat a particular condition. Each drug can be classified into one or more drug classes. Drugs are classified into different groups according to their chemical characteristics, structure and how they are used to treat specific disease.

A. Antiseptics and disinfectants:

An antiseptic is a chemical agent that reduces the microbial population on skin and other living tissues. Note: An ideal antiseptic would have a broad spectrum of activity, low toxicity and high penetrability.

Disinfection is the elimination of many or all pathogenic organisms, excluding spore forms, from an inanimate object.

Note: The ideal characteristics of a disinfectant include a broad spectrum, fast action, activity in the presence of organic material compatibility with detergents, low toxicity, and residual

i. Alcohols

The two most commonly used are **ethyl** and **isopropyl** alcohol.

The alcohols have excellent antibacterial activity against most vegetative gram-positive, gram-negative, tubercle bacillus organisms but do not inactivate bacterial spores. They are active against many fungi and viruses.

Example: ethanol, denatured alcohol, isopropyl

ii. Chlorine compounds

Chlorine compound belong to large group of compound known as Halogens. Chlorine kills vegetative forms of bacteria, algae, and fungi.

- **Example:** Chlorine is one of the few disinfectants effective against parvovirus.

iii. Iodine compounds and iodophors

Iodine compound and Iodophors are most commonly used as topical antiseptics before surgery procedure or for disinfection of tissues. Iodine and high concentrations of Iodophors are bactericidal, virusidal, protozoacidal and fungicidal.

iv. Chlorhexidine

Chlorhexidine, is a member of a class of antiseptic known as Biguanides, is one of the most commonly used disinfectants and antiseptics compounds in veterinary medicine. It has virusidal, bactericidal (both gram-positive and gram negative), and fungicidal properties.

v. Quaternary ammonium compounds

Quaternary ammonium compounds or **"**Quats" are used in veterinary medicine to disinfect the surfaces of inanimate objects. Quaternary ammonium compounds are effective against gram-positive bacteria,but they are ineffective against bacterial spores and have poor efficacy against fungi and gram-negative bacteria.

- Example: Benzalkonium chloride.

vi. Peroxides and oxidants

These compounds generally exert a short-acting germicidal effect on most organisms through release of nascent oxygen, which irreversibly alters microbial proteins.

B. Antibiotics:

Are the drugs that kill or inhibit the growth of micro-organism or microbes such as bacteria, protozoa and fungi. The term antibiotic is often used interchangeably with the term antimicrobial.

i. Penicillins

Penicillin remains a popular antibiotic and is still the drug of choice for initial treatment of many infections in horses and cattle. It has little usefulness in small animals because of the high incidence of resistance.

Microbial susceptibility: They are active against some gram-positive, but only selected gram negative bacteria. Many anaerobic bacteria are susceptible. These drugs are also active against most spirochetes, including Leptospira and *Borreliaburgdorferi*.

Examples: Aminopenicllin, Ampicillin, amoxicillin Hetacillin, Cloxacillin, Dicloxacillin, Oxacillin, Carbenicillin and TicarcillinPiperocillinetc.

ii. Cephalosporins

Cephalosprins have commonly been used in veterinary medicine for many infections, including pyoderma, urinary tract infection, pneumonia, soft-tissue infection, osteomyelitis, and pre- and postsurgical use.

Microbial susceptibility:

First Generation: The first generation drugs are effective against almost all gram-positive bacteria, except *Enterococcus*.

Second Generation. In general, these drugs have greater activity against many gram-negative bacteria that are resistant to the first-generation drugs.

Third Generation. This group of antibiotics has more activity against gram-negative bacteria than the earlier generations of cephalosporins.

Fourth Generation. Recently, there has been designation of a fourth-generation of cephalosporins. The use of these has not been reported in veterinary medicine except for some experimental studies.

iii. Aminoglycosides

Aminoglucosides are powerful group of antimicrobials used in veterinary medicine to combat a variety of serious bacterial infections.

Microbial susceptibility: Aminoglucosides are highly effective against many oxygen-dependant (*aerobic*) bacteria but are ineffective against most anaerobic bacteria.

Example: Gentamicin,Amikacin,Neomycin,Streptomycin,Kanamycin,Tobramycin,andNetilmicin.

iv. Tetracyclines

Tetracyclines are a group of bacteriostatic antimicrobials that have been used in veterinary medicine for many years, especially in animal's food production.

Example: Oxytetracycline, Chlortetracycline, Demethylchlortetracycline,Tetracycline,Rolitetracycline, Methacycline,Minocycline,….).

Microbial susceptibility: Tetracyclines are broad-spectrum which comprises both aerobic and anaerobic gram –positive and gram-negative bacteria.

v. Quinolones

Quinolones, or fluoroquinolones, are a group of bactericidal antimicrobials that are continually expending in human and veterinary medicine.

Microbial susceptibility:

- Enrofloxacin: is used in the treatment of dermal, respiratory, and urinary tract infections (including prostatitis) in dogs, cats, and birds and in respiratory infections in cattle.
- Danofloxacin: is used for the treatment of bovine respiratory infections including Mannheimia species.
- Difloxacin: is used for treatment of dermal, respiratory, and urinary tract infectionsin dogs.
- Orbifloxacin and Marbofloxacin: are used for the treatment of dermal, respiratory, and urinary tract infections of dogs and cats.
- Orbifloxacin: is used for susceptible Gram (–) infections in horses.

vi. Macrolides

They are prepared as sulfate salts or as esterified salts of stearate, tartrate, estolate, or lactobionate.

Example: Erythromycin, Azithromycin, Clarithromycin, Tulathromycin, Tylosin, and Tilmicosin.

Microbial susceptibility: Macrolides are bacteriostatic by inhibiting bacterial protein synthesis. Their antimicrobial activity is primarily against Gram(+). Tylosin and Tiamulinare effective against some Gram (–) pathogens.

vii. Chloramphenicol

Chloramphenicol is an unusual natural compound because it contains dichloracetate and nitrobenzene moieties as part of its structure.

Microbial susceptibility: They are bacteriostatic and broad spectrum and are effective against most.

viii. Sulphonamides

Sulfonamide were the first antimicrobials used on widespread basis in human and veterinary medicine, because they have been in use for many years, many strains of bacteria have became resistant to them.

Microbial susceptibility: Sulfonamides are broad spectrum (including protozoa) and bacteriostatic.

Example: Sulfamethazine,Sulfadimethoxine,Sulfachlorpyridazine,Sulfamethoxazole,Sulfacetamideand Sulfasalazine.

C. Antifungals

This group of antimicrobial drugs was developed to be effective against many of the fungal organism that cause superficial mycoses.

i. Amphotericin B

Amphotericin B is effective against most of the deep mycosis; it is fungicidal against most organisms causing systemic mycoses

ii. Griseofulvin

Griseofulvin is actively taken up by growing dermatophytes (ringworm). It binds to microtubules to inhibit spindle formation and mitosis. It is fungistatic for dermatophytes

iii. . Azoles (Imidazole derivatives)

Azole antifungal agent also called Imidazole derivatives are composed of two groups which are Imidazoles and Triazole. Azoles are fungistatic for most pathogenic fungi

D. Antiparasitic drugs

Antiparasitics are drugs that reduce parasite burdens to a tolerable level by killing parasites or inhibiting their growth.

i. Anthelmintics

- Benzimidazoles (BZD)

Thiabendazole is the prototypical agent. It is approved for use in ruminants and horses. It is no longer used as a nematocide.

- Nicotinic agonists:

- Levamisole is approved for use in ruminants and pigs.
- Pyrantel and morantel:Pyrantel is effective against strongyles, ascarids, it has limited efficacy against whipworms.
- Macrocyclic lactones: Macrocyclic lactones (macrolide endectocides).These compounds are antibiotics derived from Streptomyces ,
- Ivermectin

All species:Ivermectin is effective against all ectoparasites. It is used especially to control mites.

- Doramectin:
  - Cats:selamectin prevents heartworms and kills ascarids, hookworms, fleas, and ear mites.
  - Dogs:selamectin prevents heartworms and kills fleas (adults, larvae, and eggs),
  - Miscellaneous nematocides:dichlorvos, piperazine.

- Dichlorvos: an organophosphate, is marketed for use in pigs only, it is effective against major GI worms

- Piperazinehas a limited spectrum of action but is effective against ascarids and nodular worms in all species.

- Anticestodal drugs

- Dichlorophene is used to treat*Taenia* and *Dipylidium* infestations in dogs and cats. Its efficacy against *Echinococcus* is variable.
- Praziquantelis effective against all species of tapeworms andkills both adult and juvenile stages of the worms.

- Pyrantelpamoate: It is effective against equine tapeworms *Anoplocephala*

➢ Antitrematodal drugs

- Clorsulon is the most effective drug against *F. hepatica*, killing both mature and immature flukes in cattle.

E. Antiprotozoal drugs

✓ Decoquinate: Decoquinate is approved for use in cattle, sheep, goats, and broilers for the prevention of coccidiosis. It is not effective to treat clinical coccidiosis. It is usually used as a feed additive.

✓ Amprolium: Amprolium is the only anticoccidial agent that can be used in laying birds and cattle for both the prevention and treatment of outbreaks, it is rarely used alone.

✓ Nicarbazin: Nicarbazin is approved for use in chickens to prevent coccidiosis outbreaks.

✓ Sulfonamides: These drugs are used for both the prevention and treatment of coccidiosis outbreaks in all species.

✓ Metronidazole: Metronidazole is a broad spectrum antiprotozoal drug that is effective against *Giardia*,*Histomonas, Babesia, Trichomonas*,

✓ Drugs for treatment of toxoplasmosis:

1. Trimethoprim-sulfadiazine
2. Pyrimethamine
3. Clindamycin

✓ Imidocarb for treatment of babesiosis in dogs: Imidocarb is effective against *Babesiacanis* when given at a single dose.

Although effective against bovine babesiosis, imidocarb should not be given to this species because the withdrawal times have not been determined.

✓ Drugs for treatment of Theileriosis (ECF):

There are currently three effective drugs for the treatment of ECF: parvaquone (Clexon), buparvaquone (Butalex), and halofuginone lactate.

F. Acaricides and insecticides

✓ Insecticides are any substance or a mixture of substances intended to prevent, destroy, repel, or mitigate insects. Similarly, acaricides are substances that can destroy mites.

- ✓ An ideal insecticide or acaricide should be efficacious without risk to livestock or persons making the application and without leaving residues in tissues, eggs, or milk. Only a few compounds may meet all these requirements.

G. Anti-inflammatory drugs

i. Steroid anti inflammatory

Glucocorticoid are natural hormones normal produced by the adrenal cortex in response to release of adrenocorticotropic hormone (ACTH) by the anterior pituitary gland.

- Examples: Methylprednisolone, Dexamethasone, Prednisolone/prednisolone,

ii. Non-steroidal anti inflammatory

The nonsteroidal anti-inflammatory drugs (NSAIDs) discussed under two classes, namely, inhibitors of prostaglandin (PG) synthesis and miscellaneous (locally applied) anti-inflammatory drugs.

- Examples:

- ✓ Aspirin (Acetylsalicylate): Aspirin is a prototypical NSAID that is effective and inexpensive. Therapeutic uses: In general, aspirin is useful as an analgesic and an NSAID in dogs and cats, particularly in the control of osteoarthritis. However, it is not effective in treating colic.
- ✓ Acetaminophen: Acetaminophen (paracetamol) is a para-aminophenol derivative with analgesic and antipyretic effects similar to those of aspirin, but it has weaker anti-inflammatory effects than does aspirin and other NSAIDs.
- ✓ Phenylbutazone. The safety and efficacy profile in addition to its affordability makes it is the most commonly used NSAID in the horse and others species. Therapeutic uses: It is used to treat various forms of lameness as well as osteoarthritis and other painful conditions of the limbs including soft tissue or non-articular rheumatism.
- ✓ Ibuprofen and indomethacin: These two drugs are not routinely used in veterinary medicine due to its low safety profile.
- ✓ Diclofenac: Diclofenac is a nonsteroidal anti-inflammatory drug (NSAID) taken or applied to reduce inflammation and as an analgesic reducing pain in certain conditions. It is supplied as or contained in medications under a variety of trade names. Diclofenac Sodium Injection for veterinary use is for the treatment of various bacterial infections in sheep, swine, cattle, goats, and calves.
- ✓ Novalgin: Dipyrone (Novalgin) is a readily available, relatively cheap and highly efficacious analgesic that is widely prescribed in Africa, Europe and South America. It is indicated in different situations: Catarrhal-spasmatic colic, meteorism and intestinal constipation in horses; spasms of the uterine

cervix during birth; pains of urinary and biliary origin, esophageal obstruction; joint and muscular rheumatism; for preparation of surgical and obstetrical interventions.

- ✓ Paracetamol: Paracetamol (synonym: acetaminophen) is an antipyretic and analgesic substance of thepara-aminophenol group of the non-steroidal anti-inflammatory drugs. It is used in pigs as a 10% medicated premix at a dosage rate of 15 to 30 mg/kg bw/day for 3 to 5 consecutive days in the treatment of painful disease states associated with pyrexia.

H. Antihistamines

Antihistaminic a drug that contre acts the effect of histamines by acting on histamines receptors without activating them but preventing their accessibility to histamines.

- Example:Laratadine, Diphenhyldramine, Dixylamine, Clemastines, meclisine, Demenhydrate, chropheniranine, Cyclizine,Terfanadine and Hydroxyzine.

I. Hormones

Are chemical messenger produced by endocrine gland and secreted directly into blood vessels. They travel in the bloodstream to all parts of the body and produce effect when the find the receptor in or on cells.

Example:

- ✓ Oxytocine

The two targets for Oxytocin are the uterus and the mammary glands.

oxytocin causes contractions of myometrium(the muscles of the uterus) at the time of breeding and at parturition.

Indication

- o At the time of breeding oxytocin induces uterine contraction that aids the transport of spermatozoa up to oviduct.
- o When parturition (birth process) begins oxytocin stimulates strong uterine contraction that aid in the delivery of the fetus and the placenta.
- o During a prolonged or a difficult labor oxytocin in the form of an injectable drug is some time given to dams to help strengthen weak uterine contraction.

- ✓ Prostangalandine (PGF2α=Estrumate)

Indications

- Synchronization of oestrus in cow and heifer
- Treatment of non-observed oestrus
- Induction of calving
- Inducing abortion and expulsion of mummified calve
- Treatment of pyometra
- Treatment of endometritis

J. Vaccines

Vaccine is a preparation of killed microorganisms, living attenuated organisms, or living fully virulent organisms that is administered to produce or artificially increase immunity to a particular disease

There are several different types of vaccines. Each type is designed to teach your immune system how to fight off certain kinds of germs

i. Live attenuated

Live vaccines use a weakened (or attenuated) form of the germ that causes a isease.Because these vaccines are so similar to the natural infection that they help prevent, they create a strong and long-lasting immune response

ii. Inactivated

Inactivated vaccines use the killed version of the germ that causes a isease.Inactivated vaccines usually don't provide immunity (protection) that's as strong as live vaccines. So you may need several doses over time (booster shots) in order to get ongoing immunity against diseases.

K. Anesthetics

Anesthetic is a substance that makes you unable to feel pain

i. Local anesthetics

Local anesthetics are medications that block the conduction of impulses in nerves that relay pain signals. These are also commonly known as "numbing agents". Local anesthetics can be injected or sprayed in a small region to create a localized area without sensation, or can be injected next to major nerves to decrease the sensation to an entire limb

ii. General anesthetics

General anesthetics are medications that induce and maintain a state of unconsciousness. They cause anterograde amnesia, meaning that a patient does not remember the events that follow their administration

L. Minerals and vitamins

Many vitamins and minerals play a role in maintaining skin health. Several can be used to treat skin diseases and disorders.

Retinoids, which are naturally occurring and synthetic compounds with vitamin A activity, have been used for certain conditions involving the sebaceous (oil-producing) glands in the skin. The retinoids used most commonly are isotretinoin and acitretin.

Vit K: Vitamin K-1 Injection is a yellow, sterile, aqueous colloidal solution of vitamin K1, with a pH of 5.0 to 7.0, available for injection by the intravenous, intramuscular, and subcutaneous routes. Vitamin K-1 Injection is indicated in cattle, calves, horses, swine, sheep, goats, dogs, and cats to counter hypoprothrombinemia induced by ingestion of anticoagulant rodenticides.

Zinc is critical for the formation of keratin, the substance that forms the basis of skin, hair, and nails. Zinc supplementation can be given in cases of insufficient intestinal absorption, including deficiency syndrome I (Siberian Huskies, Alaskan Malamutes) and syndrome II (rapidly growing dogs on zinc-deficient diets). Diets high in phytates or minerals may inhibit zinc absorption. Supplementation is typically lifelong.

Iron Hydrogenated Dextran Injection: It is a sterile solution containing 100 mg of elemental iron per mL, stabilized with a low molecular weight hydrogenated dextran and 0.5% phenol as a preservative. It is indicated for the prevention and treatment of anemia due to iron deficiency in baby pigs.

Calcium: Calcium is a major structural component of bones and teeth, and is an essential dietary mineral. Various forms of calcium are available for supplementation. Calcium bound to lactate, citrate, ascorbate, and other organic acids appears to be more easily and completely absorbed than inorganic calcium supplements, such as calcium carbonate.

In cattle, oral administration of calcium salts is used for treatment of hypocalcemia (Milk fever). The hypocalcemia of bovine postparturient paresis is treated intravenously with calcium gluconate.

1.3: Identify and select veterinary drugs acting on different systems

The Anatomical Therapeutic Chemical (ATC) Classification System is used for the classification of drugs. This pharmaceutical coding system divides drugs into different groups according to the organ or system on which they act and/or their therapeutic and chemical characteristics.

Topic 1: Drug acting on gastro-intestinal tract

A. Emetics drugs

Emesis(vomiting) is a normal, protective mechanism designed to remove substances the body perceives as toxic. An emetic is that produces vomiting with the intent of removing an ingested toxic substance before it can be absorbed by the body.

i. Central acting emetics

- Apomorphine HCl

It is also effective IM, SQ, or via conjunctival drops. Apomorphine administration should notbe repeated because the vomiting center is depressed after the initialchemoreceptor trigger zone(CRTZ) stimulation.

- Xylazine

Xylazineinduces vomiting in cats following IV or IM administration. Onset of vomiting occurs in 2–5 minutes and may be followed by mild sedation for 30–90 minutes.

ii. Peripheral acting emetics

Peripheral acting emetics stimulate sympathetic and vagal afferent receptors in pharynx and stomach to induce vomiting.

- Sodium chloride

It is administered as crystals of table salt. It is the most effective household emetic in dogs.

- Syrup of Ipecac

It contains emetine alkaloid and is the recommended household emetic for children. It is less reliable in dogs and cats but may induce vomiting in 15–30 minutes.

- Copper sulfate (1%), zinc sulfate(1%) or hydrogen peroxide (3%) solution

They may produce emesis but the response is variable and they are seldomly used now.

B. Antiemetic drugs

Antiemetics drugs prevent or decrease vomiting.

- ❖ Phenothiazines

The phenothiazine tranquilizers exert their antiemetic action by blockade of dopamine.Although they are broadspectrumantiemetics, they tend to be less effective in vomiting arising from severe inflammation of the GI tract or the inner ear.

Others examples:Acepromazine, chlorpromazine, promazine, or prochlorperazine are administered orally or IM every 6 hours to prevent vomiting in dog.

- ❖ Metoclopramide: Metoclopramide has both central and peripheral antiemetic actions.
- ❖ Butyrophenones: Droperidol and haloperidol are neuroleptic drugs which are also central acting antiemetics.
- ❖ Antihistaminic agents: Antihistaminic agents block histaminergic and cholinergic afferents from the vestibular organs to the vomiting center. They are useful in the prevention of motion sickness in dogs.
- ❖ Anticholinergic agents: Anticholinergic drugs block cholinergic afferents from the GI tract to the vomiting center. Although they are generally less active than other antiemetics when used alone, they may be effective when combined with phenothiazines in the control of emesis arising from severe gastroenteritis. An example of this combination is isopropamide+ prochlorperazine = Darbazine.

C. Anti diarrheals

- ✓ Diarrhea is defined as an increase in the frequency, volume, or fluidity of stools.
- ✓ Therapy for diarrhea includes fluids, electrolyte replacement, maintenance of acid/base balance, and control of discomfort. Antiparasitic drugs or dietary therapy can also play an important role in the treatment of some types of diarrhea. Additional therapy may include intestinal protectants, motility modifiers, antimicrobials, anti-inflammatory drugs, and antitoxins.
- ✓ Examples: Kaolin-pectin, Activated charcoal, Anticholinergic drugs are common ingredients in antidiarrheal preparations because they significantly decrease intestinal motility and secretions.

D. Laxatives and purgatives

Laxatives promote evacuation of the bowel through stimulation of fluid and electrolyte transport and increases in propulsive motility.

i. Hyperosmotic laxatives:

- ❖ Lactulose is the most effective agent in this group. The organic acids producedfrom lactulose fermentation stimulate colonic fluid secretion and propulsive motility.
- ❖ Polyethylene glycol: are isotonic mixtures of polyethylene glycol, sodium sulfate, sodium bicarbonate, sodium chloride, and potassium chloride.
- ❖ Magnesium sulfate: Epsom salts or magnesium hydroxide.

ii. Bulk laxatives

Bulk laxatives comprise poorly digestible polysaccharides which absorb water and increase fecal bulk which stimulates large bowel.

- ❖ Lubricants and surfactants: Mineral oil (liquid petrolatum) and white petrolatum lubricate and soften fecal mass.
- ❖ Emollient laxatives: Emollient laxatives are anionic detergents that increase the miscibility of water and lipid in digesta, thus enhancing lipid absorption and impairing water absorption.
- ❖ Example: Dioctyl sodium,sulfosuccinate and dioctyl calcium sulfosuccinate.

iii. Irritant laxatives

Irritant cathartics are derived from plants and are activated in the GI tract to release irritant derivatives which activate myenteric neurons and smooth muscle to increase gut motility. They are used primarily in non-ruminant large animals.

- ❖ Example: Anthraquinone (emodin).

E. Ruminatoric and antibloat medication

i. Ruminotorics

Agents and mixtures that promote forestomach function (fermentation and motility) are known as ruminotorics.

- ✓ Cholinergicssuch as neostigmine or bethanechol transiently increase the frequency but not the strength of contractions in rumen atony.Since they do not provide the synchronized contractions and relaxations of theforestomachs, their value for the movement of ingesta is limited. They are administered SC.
- ✓ Metoclopropamide: experimentally has been reported to increase ruminoreticular motility and abomasal contractions. Opiate antagonists such as naloxone stimulate extrinsic contractions in endotoxin-induced ruminal stasis when administered parenterally.
- ✓ Ruminal fluid transfer.Oral inoculation of viable rumen bacteria and protozoa is the most effective means of restoring rumen function following correction of the primary cause of stasis.

ii. Bloat therapy

Ruminal bloat or tympany is the accumulation of excess gas in the rumen as a result of impaired elimination, not excess production. Ruminal gasses may be in the free form or, more commonly, entrapped in froth.

Antibloat agents alter the surface tension of froth and break up the bubbles which contain entrapped gases:

- ✓ Poloxalene (25–50 g for cattle).
- ✓ Polymerized methyl silicone (3% emulsion; 30–60 mL in cattle; 7–15 mL in sheep).
- ✓ Vegetable oils (soybean, peanut, or sunflower oil); 60 mL in cattle; 10–15 mL in sheep.

Topic 2: Cardiovascular and respiratory system

A. Cardiorespiratory analeptics

Doxapram hydrochloride is an analeptic and a centrally acting respiratory stimulant that also increases the sensitivity of the peripheral chemoreceptors located in the carotid bodies.

B. Vasodilators

As the name implies, vasodilator drugs relax the smooth muscle in blood vessels, which causes the vessels to dilate. Dilation of arterial (resistance) vessels leads to a reduction in systemic vascular resistance, which leads to a fall in arterial blood pressure.

Other vasodilators can further improve cardiac output and reduce edema and effusions in selected heart failure patients. Agents that reduce arteriolar resistance are also used in the treatment of hypertension. Vasodilators can affect arterioles, venous capacitance vessels, or both (“balanced” vasodilators).

Arteriolar dilators decrease systemic vascular resistance, arterial blood pressure,and afterload on the heart by relaxing arteriolar smooth muscle. This helps improve forward cardiac output and can reduce (mitral) regurgitate flow, thereby decreasing left atrial pressure and pulmonary congestion. An arteriolar or mixed vasodilator drug should be initiated cautiously to avoid hypotension and reflex tachycardia.

Venodilators relax systemic veins, increase venous capacitance, decrease cardiac filling pressures (preload), and reduce pulmonary congestion. They are used mainly in treating acute Chronic Heart Failure (CHF).

1. Hydralazine

Hydralazine is a phthalazine derivative vasodilating agent. Hydralazine directly relaxes arteriolar smooth muscle with little effect on the venous system.

Therapeutic uses: Hydralazine, in combination with furosemide, is especially useful for dogs with mitral insufficiency and severe pulmonary edema by rapidly reducing arterial resistance (afterload). Hydralazine has also been used in the treatment of myocardial failure and hypertension.

2. Amlodipine

Amlodipine besylate is dihydropyridine Ca^{2+}channel blocker.

Therapeutic uses: Amlodipine is the drug of first choice for systemic arterial hypertension in cats. It can be a useful adjunct therapeutic agent in hypertensive dogs.

3. Nitrates

Commonly used nitrates include sodium nitroprusside (for IV infusion), nitroglycerinetopical ointment (2%), and oral isosorbidedinitrate.

C. Diuretics

Diuretic therapy is indicated to control edema and effusions that occur in chronic heart failure. Excessive use of diuretics in heart failure exacerbates neurohormonal activation.

1. Furosemide: This loop-diuretic is used almost exclusively for animals with cardiogenic edema or effusion. Adverse effects are usually related to excessive fluid and/or electrolyte losses.

2. Spironolactone. This K+ sparing diuretic may be a useful adjunct therapy for chronic refractory heart failure, although it appears to have little diuretic effect in normal dogs.

Adverse effects relate to excess K+ retention and GI disturbances.

3. Thiazide diuretics. Chlorothiazide or hydrochlorothiazide is occasionally used in combination with furosemide and other therapy for refractory CHF.

D. Antitussives and expectorant

i. Antitussives agents

They diminish the frequency of coughing and should not be used to suppress productive coughs. They can be either locally acting (e.g. glycerin), or centrally acting (e.g. opiates); they can be divided into opioid and non-opioid antitussives.

- ✓ Butorphanol and codeine are potent opioid antitussives but may cause sedation, ataxia and excessive respiratory depression.
- ✓ Dextromethorphan is almost as effective a cough suppressant as codeine but does not cause respiratory depression.
- ✓ Diphenhydramine has anticholinergic, antihistamine and antitussive properties. Its antitussive mechanism of action remains unclear.

ii. Expectorants

Expectorants theoretically make the bronchiole secretions less viscous but their efficacy is questionable.

- ✓ Potassium iodide is an oral saline expectorant, which causes irritation to thegastric mucosa that in turn increases bronchiole secretion through a vagal reflex.
- ✓ Guaifenesin may stimulate the gastric mucosa and increase respiratory tract secretions via reflex.

e. Bronchodilator

Introduction

Bronchodilators are a type of medication that makes breathing easier by relaxing the muscles in the lungs and widening the airways (bronchi).

They're often used to treat long-term conditions where the airways may become narrow and inflamed

Bronchodilators may be either:

- short-acting – used as short-term relief from sudden, unexpected attacks of breathlessness
- long-acting – used regularly, to help control breathlessness

Bronchodilators and corticosteroids

Inhaled corticosteroids are the main treatment to reduce inflammation and prevent flare-ups in asthma.

Treatment with corticosteroids and bronchodilators may require the use of separate inhalers, but increasingly these medications are provided together in single inhalers.

Types of bronchodilator

The three most widely used bronchodilators are:

- beta-2 agonists – such as salbutamol, salmeterol, formoterol and vilanterol

- anticholinergics – such as ipratropium, tiotropium, aclidinium and glycopyrronium
- theophylline

f. Vasoconstrictor

Medications causing vasoconstriction, also known as vasoconstrictors, are one type of medicine used to rise blood pressure. Generalized vasoconstriction usually results in an increase in systemic blood pressure, but it may also occur in specific tissues, causing a localized reduction in blood flow. The extent of vasoconstriction may be slight or severe depending on the substance or circumstance. Many vasoconstrictors also cause pupil dilation. Medications that cause vasoconstriction include: **antihistamine, decongestant, and stimulant.**

g. cardiac glycosides

Cardiac glycosides are drugs that inhibit the Na^+/K^+- ATPase found on the outer cell surface. Digoxin is the only drug of this class that is commonly used in clinical settings. The main indications for digoxin treatment are atrial fibrillation and heart failure in treatment-resistant cases. Because cardiac glycosides have a narrowing therapeutic index, close monitoring of serum concentrations is necessary. Typical symptoms of cardiac glucoside poisoning are nausea, vomiting, blurry vision, and cardiac arrhythmias. Overdose can quickly become life-threatening and swift treatment is vital. The first-line treatment for cardiac glucoside poisoning is administration of digoxin-specific antibodies.

Topic 3: Drugs acting on nervous system

Drugs used to treat the nervous system fall into several categories: anticonvulsants, tranquilizers, sedatives, analgesics, and psychotropic agents.

A. Analgesics/antalgics

Analgesia is the relief of pain. Pain is normally defined as an unpleasant sensory and emotional experience associated with potential or actual tissue damage. Pain is difficult to assess in animals because of the inability to communicate directly about what the animal is experiencing. Instead, indirect signs of pain are often used.

Analgesics are pain relievers most often given after a surgery.Nonsteroidal antiiflammatory drugs (NSAIDs) may also be used for their analgesic effect. The NSAIDs consist of drugs like aspirin, ketoprofen, acetaminophen, flunixin and ketorolac. There are a large number of these drugs available, however, relatively few are used in animals. NSAIDs are, in general, less potent analgesics than are the narcotics. However, in specific instances they can have similar activity.

B. Tranquillizers (anxiolitics) and sedatives (Neuroleptics)

Tranquilizers and sedatives produce a relaxed state usually without producing significant analgesia (unless the drugs specifically have analgesic properties).

Lists of some drugs that fall into this group:

• Phenothiazines

Acepromazine

- ✓ chlorpromazine (mainly used as an anti-emetic)
- ✓ trimeprazine (antihistamine, sedative, antitussive, antipruritic)

• Benzodiazepines

- ✓ Diazepam
- ✓ Midazolam
- ✓ Zolazepam (combined with the dissociative drug tiletamine)

• Butyrophenones

- ✓ Droperidol (combined with the opioid fentanyl)
- ✓ Fluanisone (can be combined with fentanyl)

C. Anesthetics

✓ Local anesthetics: Drugs that can be used clinically to block pain sensation from sympathetic vasoconstrictor impulses to specific areas of the body. Basic physicochemical and pharmacodynamic characteristics of the major aminoester and amide local anesthetics that are currently used in veterinary practice.

- ❖ Esters: Benzocaine ,Tetracaineand Procaine
- ❖ Amides : Lidocaine, Mepivacaine, Bupivacaine and Levobupivacaine
- ❖ Other local anesthetics : Prilocaine, Proparacaine, Amethocaine, Cocaine etc.

✓ General anesthetics: A substance that causes general lack of feeling or awareness, pain to permit surgery and other painful procedures.

Note: The sedatives can be used as general anesthetics when is administered in large amount.

These sedatives include: acepromazine, chlorpromazine, droperidol (Innovar-Vet) azaperone (Stresnil).

General anesthetics are:

- Opiates:buprenorphine (Buprenex), pentazocine (Talwin) and nalbuphine (Nubain), or a mixture of analgesia and euphoria with sedation as with: butorphanol (Torbugesic), fentanyl (Innovar-Vet), morphine, meperidine (Demerol) or oxymorphone.
- Barbiturates:
  - ✓ Phenobarbital is the longest acting of the barbiturates.
  - ✓ Pentobarbital is a short acting oxybarbiturate.

D. Anticonvulsants

Only a few of the anticonvulsant drugs available for human use have been proven to be clinically useful in dogs and cats.

- Barbiturates: -Phenobarbital, - Primidone, - Pentobarbital
- Phenytoin
- Benzodiazepines

Topic 4: Endocrine systems

Hormones drugs either natural or synthetic are used in food animals and horses to synchronize oestrus cycle, terminate pregnancy, and induce ovulation.

A. Drugs affecting reproductive system (Hormones)

Those are:

1. Oestradiol (Oestradiol benzoate): Oestradiol is an oestrogen used for the treatment of misalliance and hormonal urinary incontinence in bitches.

2. Megoestrol acetate (Ovarid): This is an oral progestogen, indicated for the prevention of oestrus in the bitch.

3. Others hormones are: Gonadotropins, FSH, LH, Equine chorionic gonadotropine, Human chorionic gonadotropin, progestin's, progestogens, progestationalhormons, estrogens, prostaglandins, corticosteroid, corticosteroid and oxytocin.

1.4: Arrange veterinary drugs

Topic 1: Methods of drug arrangement:

There are several arrangement methods that can be employed. Each company has to choose the one that is best suitable for their environment. However, only four are really applicable to hospital and community or retail pharmacy

A. Alphabetical order by generic name

Generic name use should be the recommended international (Rinn). The arrangement involves placing drugs based on their generics in alphabetical order. The generic drug that begins with the letter A will start the shelf

B. Pharmacotherapeutic category

This is a very good system. It is easy for a new pharmacy to understand this arrangement than for sales assistant. It involves classification of the drugs based on what they do then arranging them accordingly. In most cases, the secondary arrangement is done alphabetically. That is, antibiotic drugs will be arranged alphabetically. Drugs like cefuroxime, cephalaxein, cefixime, etc will be arranged in alphabetical order

C. Drug forms

This can be term the best arrangement. Medical products come in different forms. Some are solid, liquid, semi liquid, etc. The drugs are arrange according to the dosage form such as oral tablet will be in a place, oral solution, syrups, oral drops and suspension in another. Others are creams and emulsion for external use only. These products can be arranged in alphabetical order based on their generic names or brand name.

D. Frequency:

this system is very easy to include in the store but only after spending some time in the area. That is, a new store cannot start with this.

Topic 2: Conservation material:

Technical inventory control of drugs and others supplies are usually taught in conjunction with business management concepts. However, besides the business aspects, medical and legal reason exists for proper storage and handling of drugs.

Among the conservation material we have the fridge, shelves, cool box, etc. Note that each material has its physical properties which permit it to conserve this kind of drugs and not for that drug due to its conservation requirements. For example drug that is not stored in the proper temperature and light can degenerate or become inactivated, providing little or no benefit.

Topic 3: Storage conditions

A. General storage condition

Unless special storage conditions are stated, it is vital that drugs be stored in a dry, adequately ventilated shady and cool store room. Efforts should be made to maintain the specified storage conditions with regard

to exposure to humidity, sun light, heat, etc. When a product label states “Protect from moisture”, store the product in a space with no more than 60% relative humidity.

Free air circulation by opening windows, using fans or air conditioners can be considered to reduce the effects of humidity.

Some products are photosensitive and will be damaged if exposed to light.

To protect products from sunlight:

- ✓ Shade the windows or use curtains, if they allow the passage of direct sunlight,
- ✓ Keep products in cartoon
- ✓ Do not store or pack products in sunlight

Heat will also affect many products. It melts ointments and creams and affects other products.

It is important to have thermometers, hygrometer and other equipment in order to regulate the temperature and humidity of storage areas.

B. Cold storage conditions

Cold storage conditions can be maintained by using refrigerators and freezers for products that may be degraded rapidly when kept at room temperature or even at cool places, e.g. vaccines, insulin, etc.

The following guidelines are recommended when using refrigerators and freezers:

- Refrigerators that open on the top are more efficient than vertical ones, because hot air rises while cold air falls
- Store products that are sensitive to freezing or very low temperatures on the upper shelves.
- If there is enough space, place a few plastic bottles of water in the refrigerator. This will help maintain the temperature for a longer period of time if the power is cut off.

Topic 4: Drugs packaging

Drugs packaging provides information – communication tool (manufacturer, product, strength, dosage form, storage conditions,) – the company‘s voice.

The role of packaging

Products need to be packaged – clear regulations:

- ❖ Preserve & Protect

- ❖ Promote safety
- ❖ Consumer/ patient friendly

Consequences of poor packaging

- ❖ Injuries/ death resulting from confusion
- ❖ Poorly identifying products
- ❖ inappropriate use
- ❖ Miss dosing
- ❖ Inconsistencies in translations (misleading info/ confusion)
- ❖ Inappropriate storage conditions

Topic 5: Drugs arrangement in the shelves

Medication errors are common, fatal, costly but preventable. Location of drugs on the shelves and wrong drug names in prescriptions can cause errors during dispensing process. Therefore, a good drug-shelf arrangement system in pharmacies is crucial for preventing medication errors, increasing patient's safety, evaluating pharmacy performance, and improving patient outcomes. Therefore, pharmacists can identify, separate, and store drugs on shelves according to their associations and sale trends.

Topic 6: Reading notice

To administer medications safely to a client, nurses must be able to read and interpret the information on a medication label. Medication labels indicate the dosage contained in the package. It is important to read the label carefully and recognize essential information

The nurse should be able to recognize the following information on a medication label.

a. Generic Name

The generic name is given by the manufacturer that first develops the medication. Medications have only one generic name. Prescribers are ordering medications more often by the generic name, so nurses need to know the generic name as well as the trade name. Pharmacists in many institutions are dispensing medications by generic name to decrease costs. Sometimes only the generic name may appear on a medication label or package. This is common for drugs that have been used for many years, are well known, and do not require marketing under a different trade name.

Examples include morphine, phenobarbital, and atropine

b. Trade Name

The trade name is also referred to as the *brand name* or *proprietary name;* it is the manufacturer's name for the medication. Notice that the brand name is very prominent on the label and is capitalized. It is important to remember that different manufacturers may market a medication under different trade names. The trade name is followed by an ®, which is the registration symbol. Some medications may have the abbreviation™ after the trade name, which stands for trademark.

c. Dosage Strength

Dosage strength refers to the weight or amount of the medication provided in a specific unit of measure (the weight per tablet, capsule, milliliter, etc.).

d. Form

The form specifies the type of preparation available in the package.

- Examples of forms include tablets, capsules, liquids, suppositories, and ointments. Solutions may be indicated by milliliters (mL) and described as oral suspension or aqueous solution. Some medications are available in powder or granular form or as patches.
- Labels may also indicate abbreviations or words that describe the form of the medication. Examples include CR (controlled release), LA (long acting), DS (double strength), SR (sustained release), and XL (long acting).
- Abbreviations that describe the form of a medication indicate whether the medication has been prepared in a way that allows extended action, or slow release, of the active ingredient. Often, these medications are given less frequently.

e. Route of Administration

The route of administration describes how the medication is to be administered.

Example:

Oral, IM, IV, topical

It is important to realize that on some labels the route may not be stated directly. However, unless specified otherwise, tablets, capsules, and caplets are always intended for oral use. Any form intended for oral use should be administered orally.

Because all tablets, capsules, and liquids are not always given orally, read the label carefully because any variation from oral administration is indicated on the label. Examples: Sublingual tablets; otic suspension for use in ears; some capsules are placed in an inhaler and not swallowed.

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g. Total Volume

On labels of solutions for injections or oral liquids, total volume, as well as dosage strength, is stated. Total volume refers to the quantity contained in a bottle, vial, or ampule. For liquids, total volume refers to the total fluid volume.

h. Total Amount in Container

For solid forms of medication, such as tablets or capsules, the total amount is the total number of tablets or capsules in the container. The dosage strength, as well as the total amount in the container, is included on labels of solid forms of medication, such as tablets or capsules.

i. Directions for Mixing or Reconstituting a Medication

When medication comes in a powdered form, the directions for how to mix or reconstitute it and with what solution are found on the label or package insert. The directions for reconstitution should be followed exactly as stated on the label for accuracy in administration

j. Precautions

Medications may come with warnings, alerts, or precautions that are related to safety, effectiveness, or administration and need to be followed. Storage alerts might also be on the label. These precautions, warnings, and alerts may be printed on the label by the manufacturer or added by the pharmacy that dispenses the medication. Always read precautions or special alerts carefully, and follow the instructions given precisely. Examples of precautions, warnings, or alerts on a label may include the following: shake well, protect from light, may be habit formin

k. Expiration Date

Medication labels contain information such as the expiration date (which may be indicated with the abbreviation *Exp*). Expiration dates indicate the last date on which a medication should be used. Typically, the date appears as the month/year. This information can be found on the back or side of a label. Medications requiring reconstitution provide specific expiration instructions.

l. Additional Information

Other information on a medication label includes the following:

Storage Directions—This section of the medication label provides information as to how a medication should be stored to prevent the medication from losing its potency or effectiveness. Usually information is given on the label relating to temperature for storing the medication

Lot/Control Numbers—Federal law requires that all medication packages be identified by a lot/control number. This number is important in the event that medications have to be recalled.

National Drug Code (NDC) Number—This is a number required by federal law to be given to all medications. Each medication has a unique NDC number. The NDC number consists of NDC followed by a group of numbers (example: NDC 0009-5136-01 for Zyvox).

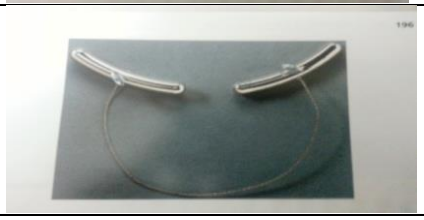
Manufacturer's Name—All medication labels contain the name of the company that manufactured the drug (examples: Pharmacia & Upjohn, Lilly). This information can be valuable; if you have questions about the medication refer to the medication labels.

Abbreviations such as USP (United States Pharmacopoeia), NF (National Formulary)—USP and NF are the two official national lists of approved medications. Special guidelines are given to the manufacturer related to use and placement of these initials on medication labels

Learning unit 2: Store veterinary instruments and equipment

2.1 Identify and select common veterinary materials, tools and equipment.

Topic 1: **Dehorning instruments**

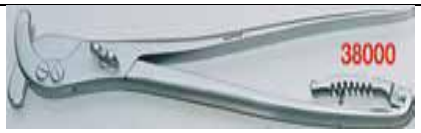
no	Name	Image	Uses
1	Disbudding iron		-Burn the buds of horns in young calves - Thermo-hemostasis -cauterization
2	Horn gouge		Remove the horn buds/ very small horns
3	Barnes dehorner		Used to cut small horns in calves, goats and sheep
4	Electric dehorner		-Burn the buds of horns in young calves -Thermo-hemostasis -cauterization
5	Keystone or guillotine		Used to remove medium to large horns
6	Dehorning saw		To incise the horn and bones
7	Wire saw with handles		To incise large horn and bones

Topic 2: Hoof care instruments

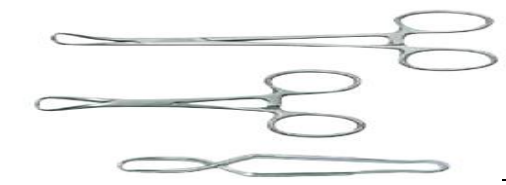
1	Nail trimmers and scissors		To cut nails
2	Hoof picks		To remove the debris from the hoof before examination
3	Hoof trimmers		To cut the horn of hoof
4	Hoof Knife		To trim the sole of foot in cattle/horse

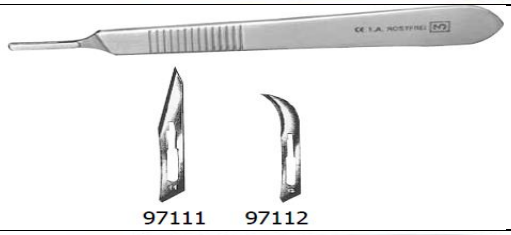
Topic 3: Castration instruments

1	Burdizzoema sculatome		To crush spermatic cord in ruminants
2	Elastrators and elastrator bands		Bloodless castration in descending testicles

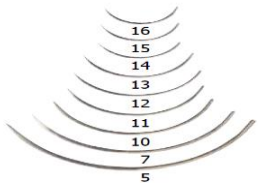
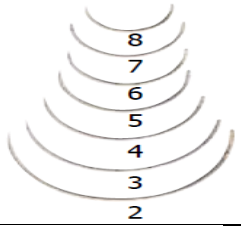
3	Emasculators		To incise the testes during open and close castration

Topic 4: Instruments in surgical packs

1	Round ended probe		Diagnose obstruction in tube-shaped organs
2	Grooved director		Used in abdominal surgery
3	Retractors		To separate the muscles for deeper visualization/access
4	Hook retractor forceps		To separate the muscles for deeper visualization/access
5	Towel clippers		To hold towel during surgery
6	Gross dressing forceps		
7	Dissecting forceps		Hold tissues to suture
8	Tissue forceps		Hold the incised skin

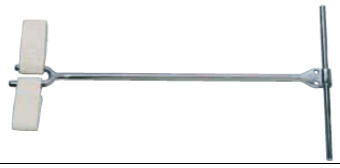
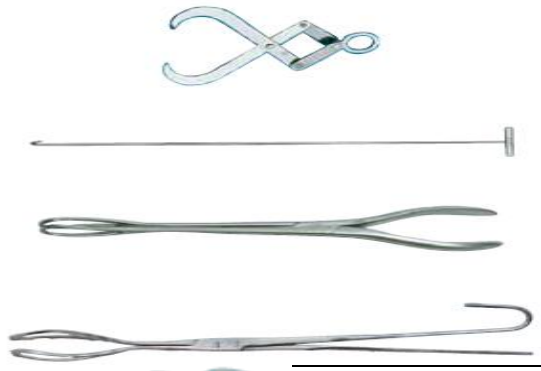
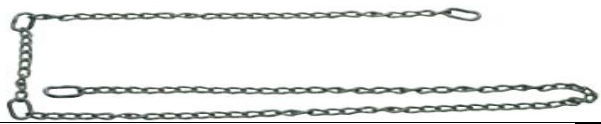
9	Scalpel handle		Hold the Scalpel
10	Scalpel blades		Hold the Scalpel
11	Scalpel handle No4 /scalpel blade		Hold the Scalpel
12	Surgical scalpels		Handle with fixed scalpel
13	Surgical scissors, stainless		For different types of cut/incisions dissections

14	Iris scissors		Dissection starting by small opening for enlargement
15	Curved scissors		For angulated incisions
16	Forceps		Hemostatic purpose and other tissue holding activities
17	Forceps for bones		Orthopedic surgery
18	Sharp spoons		Sample collection for hard tissues
19	Electric cautery		Thermohaemostasis

20	Suture needles(triangular shaped)		Skin Suture
21	Suture needles for intestines (round shape)		Intestine surgery
22	Suture needles for foreign body suture		Suture needles for irregular shaped wounds
23	Eye needle(round shape)		Eye surgery
24	Gerlash`s suture needle		Skin suture, prolapse reduction
25	Haupter` suture needle		Skin suture, prolapse reduction
26	Matheu`s Needle holder		Handle the suture needle
27	Artery forceps		For Haemostasis

Topic 5: Obstetrical instrument

1	Sand`s calving rope introducer		To insert the calving rope before feto-traction
2	Kuhn`s crutch		To insert the calving rope before feto-traction
3	Bahlke`sembryotomy wire saw introducer		To insert the Embryotomy wire saw before feto-dissection

4	Caemmerer`s torsion fork		To fixate and do torsionof calving rope before feto-traction
5	Eye Hooks		Hold and fixate the dead fetus by orbital cavities for extraction
6	Obstetric Hooks and forceps		Hold and fixate the fetus for extraction
7	Ring knives		To cut short (dissect) the dead fetus in embryotomy
8	Calving ropes		To tie and pull the fetus for extraction
9	Calving chains		To tie and pull the fetus for extraction
10			To tie and pull the fetus for extraction

11			To tie and pull the fetus for extraction
12	Calf puller		pull the fetus for extraction
13	Calf puller (rope)		To tie and pull the fetus for extraction
14	Uterine cathetors		Irrigation and drainage for the female reproductive tract
15			
16	Uterine forceps		Grasp and hold soft tissues in soft tissue surgery, eg. Uterus and muscles
17	Uterine pump		Pressure Irrigation of the female reproductive tract
18	Trocart		Stomach(rumen) punction for gas evacuation/ Diagnostic and Injection to holed organs
19	Buff`s scewtrocart		Stomach(rumen) punction for gas evacuation

20	Stomach tube		Intubation of the esophago-gastric tube
21	Wooden mouth gag		To open the mouth for drug administration
22	Irrigation		Irrigation of the ,uterine and vaginal tract
23	Foreign body cage magnets		To hold preventively any hard wire or metal In Reticulum
24	Suction pump		taking out rumen juice
25	Operation /examination table		Surgical operation/examination for small animals
26	Instrument table		Carry surgical instruments for the operation

27	Trays and dishes		Keeping and Carry surgical instruments for the operation
28	Autoclave		Instrument sterilization
29	Laboratory centrifuge		centrifugation
30	Sterilizing containers for autoclave		Keeping surgical instruments for autoclaving
31	Surgical cotton		Fluid absorption

32	Surgical gauze		Wound dressing and management
33	Gauze bandage		Wound dressing and management
34	Elastic bandage		Wound/fracture dressing and management
35	PP overall		Protection for the operator and assistant
36	Bull rings		Lead the big animals with an attached rope/ heard restraint
37	Nose holder for horse		heard restraint and Lead the horse
38	Nose holder for cattle		heard restraint and Lead cattle

39	Mouth gags		To open the mouth for drenching or any mouth exam
40			
41	Bron`s clamp		Protection from kicking in cattle, holding the Achilles' tendon
42	Anti- kick bar		Protection from kicking in cattle
43	Wire nose pig holder		Holder the nose of pig in handling
44	Sheep catching hook		To catch small ruminants
45	Sorting panel		To restrain pigs in shelter
46	Electric animal goad		handling
47	Buldizzo		Bloodless castration
48	Electric tail docking machine		tail docking in pigs

49	Hoof rasp		To rasp the hoof`s horn after sharp cut
50	Hoof tester		Diagnostic of hoof pain
51	Wooden hammer		percussion
52	Claw cutter		To cut short the nails, claws
53	Hair clipper		Clip the hair before shaving

Topic 6: Artificial Insemination instruments

1	Tube speculum		AI gun directing
2	Artificial vagina		Semen collection

3	Container for semen storage		semen storage
4	CITO thawer		To thaw semen straw before AI practice
5	AI gun		Deposit AI semen into the uterus
6	Insemination kit		Use for AI activity

Topic 7: Materials for meat inspection

1	Knives for meat inspection		meat inspection

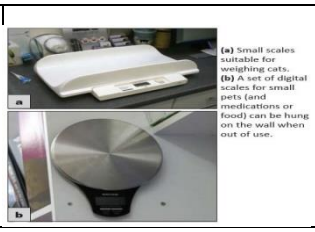
2	Meat inspection stamp		Stamping the inspected meat
3	Knife sharpener		sharpening
4	Binocular routine microscope		Microscopic diagnostic

Topic 8: Post mortem instruments

	Post mortem instruments (saw, hammer, bone chisel, scissors, dissecting knives, forceps, sharpener …)		Post mortem examination

Topic 9: Materials tools and equipment for bodyweight estimation:

Tape measure		The scales are used in veterinary clinics to measure the weight of each patient because it is used to determine the ideal

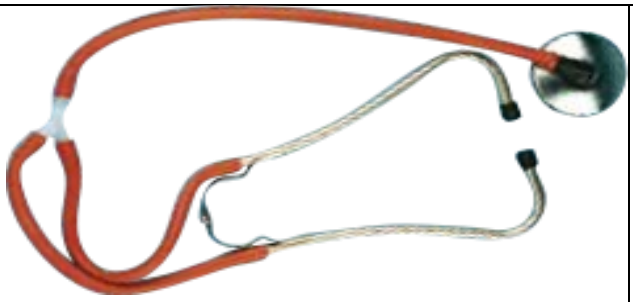
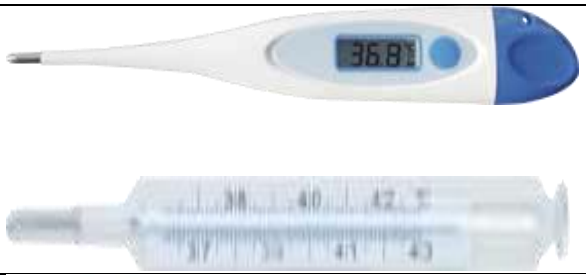
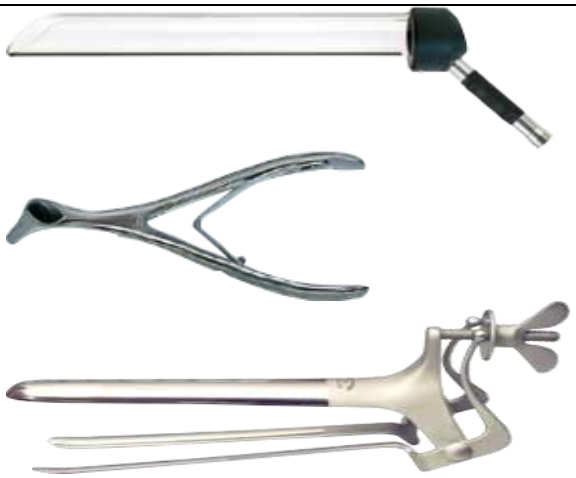
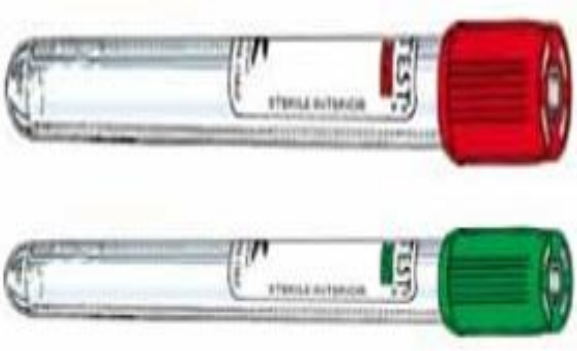
Scale		weight, health, and dose of treatment.

Topic 10: Materials tools and equipment for control the environmental parameters:

Hygrometer		A **hygrometer** is an instrument used to measure the amount of water vapor in air, in soil, or in confined spaces
Anemometor		An **anemometer** is a device used for measuring wind speed and direction
Rain gauge		A rain gauge (also known as an udometer, pluviometer, or an ombrometer) is an instrument used by meteorologists and hydrologists to gather and measure the amount of liquid precipitation over an area in a predefined period of time.
Barometer		A **barometer** is a scientific instrument that is used to measure air pressure in a certain environment
Digital oxygen meter		It simply detects oxygen concentration in contrast to hydrogen, nitrogen, carbon dioxide, carbon monoxide et
Ammonia meter		The ESCM-506 ammonia meter is a portable, handheld ammonia gas detector that is ideal for the workplace such as poultry farms.

Topic 11: Diagnostic instruments

SN	Name of the material/Instrument	Image	Use/Function

1	Stethoscopes		✓ Detection of heart beating; ✓ Trespiratory rate; ✓ Peristaltic movement ✓ Feto-viability; ✓ Fracture detection; ✓ Auscultation/per cussion
2	Thermometers		Detection of the Body temperature
3	Percussion hammer		✓ Diagnose bloat; ✓ Diagnose hoof pain ✓ Diagnose other deep suspected accumulations
4	Vaginal speculums		✓ Diagnose vaginitis and other concerning injuries; ✓ Diagnose cervicitis and level of opening ✓ Heat detection and AI in small ruminant and pigs
5	Test tubes		✓ Blood sampling, ✓ Collection of other fluids of the body, ✓ Some laboratory tests

	Binocular routine microscope		Microscopic diagnostic
6	Wood's light	 	- UV lamps for examinations ; - 2 daylight fluorescents for general illumination

2.2: Arrange materials and tools equipment

Topic 1: Types of arrangement of materials instrument and equipment:

Materials instruments and equipment are arranged according to:

a) Nature of instrument:

Metal instruments

Plastic instruments

b) Usage

- ✓ Restraining materials instrument and equipment
- ✓ Instruments for identification of animals
- ✓ Diagnostic instruments
- ✓ Administration of medicine instruments
- ✓ Dehorning instruments
- ✓ Hoof care instruments
- ✓ Castration instruments
- ✓ Instruments in surgical packs
- ✓ Miscellaneous surgical instruments and equipment
- ✓ Obstetrical instrument
- ✓ Artificial Insemination Instrument
- ✓ Materials for meat inspection
- ✓ Post mortem instruments
- ✓ Materials tools and equipment for body weight estimation

The arrangement based on usage of materials is better than the one based on nature because it facilitate selection of material for a given veterinary operation

2.3 Store the materials tools and equipment

Topic 1: Types of storage materials tools instrument and equipment

a) Storing non sterile tools instrument and equipment

Instrument may corrode as result of adverse storage conditions. To prevent this, they should be stored in a dry and dust-free condition. Major temperature fluctuation should be avoided in order to prevent accumulation of moisture on instrument surface.

Chemicals may destroy metals when in direct contact with them or may emit corrosive vapors. Never store your instruments near chemicals

b) Storing of sterile tools instruments and equipment

To guarantee instruments sterility up to the time of use, germ-tight packaging is absolutely essential. Further requirements for protected storage of sterile supplies and prevention of corrosion damage includes a dust-free and dry environment and the prevention of temperature fluctuation

c) Storing of materials tools instrument and equipment per function:

The instruments may be stored depending on their function such as:

- Instruments for identification of animals
- Diagnostic instruments
- Administration of medicine instruments
- Obstetrical instrument.
- Artificial Insemination Instrument
- Materials for meat inspection
- Dehorning instruments
- Hoof care instrument
- Castration instruments
- Instruments in surgical packs
- Miscellaneous surgical instruments and equipment
- Post mortem instruments
- Materials tools and equipment for bodwy eight estimation

Learning unit 3: Clean and sanitize workplace, instruments and equipment

3.1: Identify and select of cleaning materials, tools and equipment

Topic 1: Dfeinition of Cleaning materials:

a) PPEs:

Material	Image	Definition
Aprons		a protective garment worn over the front of one's clothes and tied at the back.

Overall		The white medical **lab** coat
gumboots		a long rubber boot
gloves		**Gloves** are pieces of clothing which cover your hands and wrists and have individual sections for each finger
lab coats	 	a white protective coat worn by workers in a laboratory
hats		a shaped covering for the head used to refer to a particular role
protective spectacles (goggles),		protective glasses set in a flexible frame (as of rubber or plastic) that fits snugly against the face
Masks		A **mask** is a piece of cloth or other material, which you wear over your face

Table: PPE instrument

b) Cleaning/sanitation supplies and materials cleaners and vacuum cleaners

Brooms		A **broom** is a cleaning tool consisting of usually stiff fibers attached to, and roughly parallel to, a cylindrical handle, the broomstick
Mops		A **mop** is a mass or bundle of coarse strings or yarn, etc., or a piece of cloth, sponge or other absorbent material, attached to a pole or stick It is used to soak up liquid, for cleaning floors and other surfaces

Table cleaning equipment

c) Sanitizers bleach

Bleach is the generic name for any chemical product which is used industrially and domestically to remove color from a fabric or fiber or to clean or to remove stains in a process called bleaching.

Many types of bleach have broad spectrum bactericidal properties, making them useful for disinfecting and sterilizing and are used in many places where sterile conditions are required

Most industrial and household bleaches belong to three broad classes:

- Chlorine-based bleaches, whose active agent is chlorine, usually from the decomposition of some chlorine compound like hypochlorite or chloramine.
- Peroxide-based bleaches, whose active agent is oxygen, almost always from the decomposition of a peroxide compound like hydrogen peroxide.

- Sulfur dioxide based bleaches, whose active agent is sulfur dioxide, possibly from the decomposition of some oxosulfur anion

Potassium permanganate.

d) Cleaning and scouring pads

A scouring pad or scourer is a small pad of metal or plastic mesh used for scouring a surface. Some scouring pads have one side made of a soft sponge-like material and the other is the aforementioned mesh



washcloths: a small cloth for washing one's face or body



Brushes: an implement with a handle and a block of bristles, hair, or wire, used especially for cleaning, applying a liquid or powder to a surface



Hoses: A hose is a flexible hollow tube designed to carry fluids from one location to another



Towel dispensers: towel dispenser is a device that dispenses towels in a public toilet so that hands can be dried after hand washing



Soaps: Soap is a salt of a fatty acid used in a variety of cleansing and lubricating products



Water: Water, a substance composed of the chemical elements hydrogen and oxygen and existing in gaseous, liquid, and solid states. Water is used for drinking, bathing, cooking food and washing dishes, clothes, fruits, vegetables and brushing.

Buckets: A bucket is typically a watertight, vertical cylinder or truncated cone or square, with an open top and a flat bottom, attached to a semicircular carrying handle called the *bail*.



3.2: Clean and sanitize the workplace materials tools and equipment

Topic 1: Regulatory/legislative requirements

The regulatory concerns involved with chemical sanitizers are antimicrobial activity or efficacy, safety of residues on food contact surfaces, and environmental safety. It is important to follow regulations that apply for each chemical usage situation.

- **Workplace cleaning and sanitization methods and techniques**

Keeping your workplace clean means having a systematic and thorough approach to keep working and storage areas clean sanitise and free from garbage and pests. It also means following hygienic practices for handling equipment and disposing of waste or garbage. All of this is necessary to prevent or minimise the risk of cross-contamination of harmful bacteria, chemicals or even disease. This would pose significant safety hazards for customers and staff.

- **Clean and sanitize instruments and equipment**

In general, surgical instruments and medications that enter an already aseptic part of the body (such as the bloodstream, or penetrating the skin) must be sterilized to a high sterility assurance level. Preparation of injectable medications and intravenous solutions for fluid replacement therapy requires not only a high sterility assurance level, but also well-designed containers to prevent entry of adventitious agents after initial product sterilization.

- **Sanitization, disinfection and sterilization**

Sterilization is the process used to render an object free of all microorganisms while Sanitation is reduction of the number of bacterial contaminants to a safe level and Disinfection is the process that destroys most pathogenic microorganisms. Both sanitization and disinfection reduce the number of targeted pathogenic organisms to what are considered "acceptable" levels

- **Cleaning, Sanitization and disinfection methods**

Disinfection is the removal of most pathogenic organisms from an object. (Disinfectants **cannot** sterilise. Where sterility is required heat treatment is always preferable.) Simple cleaning with detergent will remove the majority of micro-organisms and is an essential first step in disinfection.

i. Sterilization

Sterilization (or sterilisation) is a term referring to any process that eliminates (removes) or kills all forms of life, including transmissible agents (such as fungi, bacteria, viruses, spore forms, etc.) present on a surface, contained in a fluid, in medication, or in a compound such as biological culture media. Sterilization can be achieved by applying heat, chemicals, irradiation, high pressure, and filtration or combinations thereof.

There are two methods of sterilisation:

- ✓ **Physical Methods,**
- ✓ **Chemical Methods**

1. Physical methods of sterilization:

✓ **Sunlight:** The microbicidal activity of sunlight is mainly due to the presence of ultra violet rays in it. It is responsible for spontaneous sterilization in natural conditions. In tropical countries, the sunlight is more effective in killing germs.

✓ **Heat:** Heat is considered to be most reliable method of sterilization of articles that can withstand heat. Heat acts by oxidative effects as well as denaturation and coagulation of proteins.

✓ **Incineration:** This is a method of destroying contaminated material by burning them in incinerator. Articles such as soiled dressings; animal carcasses, pathological material and bedding etc. should be subjected to incineration.

✓ **Hot air oven:** This method was introduced by Louis Pasteur. Articles to be sterilized are exposed to high temperature (160o C) for duration of one hour in an electrically heated oven. The oven should be fitted with a thermostat control, temperature indicator, meshed shelves and must have adequate insulation.

✓ **Flaming:** This is a method of passing the article over a Bunsen flame, but not heating it to redness. Articles such as moist heat acts by coagulation and denaturation of proteins. Moist heat is superior to dry heat in action.

✓ **Red heat:** Articles such as bacteriological loops, straight wires, tips of forceps and searing spatulas are sterilized by holding them in Bunsen flame till they become red hot. This is a simple method for effective sterilization of such articles, but is limited to those articles that can be heated to redness in flame.

✓ **Infra-red rays:** Infrared rays bring about sterilization by generation of heat. Articles to be sterilized are placed in a moving conveyer belt and passed through a tunnel that is heated by infrared radiators to a temperature of 180°C.

Note: It requires special equipment, hence is not applicable in diagnostic laboratory.

MOIST HEAT:

- **At temperature 100°C:**

Boiling water (100°C) kills most vegetative bacteria and viruses immediately. Certain bacterial toxins such as Staphylococcal enterotoxin are also heat resistant. Some bacterial spores are resistant to boiling and survive; hence this is not a substitute for sterilization. The killing activity can be enhanced by addition of 2% sodium bicarbonate. When absolute sterility is not required, certain metal articles and glass wares can be disinfected by placing them in boiling water for 10-20 minutes.

Autoclave: Sterilization can be effectively achieved at a temperature above 100°C using an autoclave. Water boils at 100°C at atmospheric pressure, but if pressure is raised, the temperature at which the water boils also increases.

To destroy the infective agents associated with spongiform encephalopathies (prions), higher temperatures or longer times are used; 135°C or 121°C for at least one hour are recommended. Advantages of steam: It has more penetrative power than dry air, it moistens the spores (moisture is essential for coagulation of proteins), condensation of steam on cooler surface releases latent heat, and condensation of steam draws in fresh steam.

2. **Chemical methods of sterilization**

Disinfection can be achieved by chemical methods. Chemicals used in disinfection are called disinfectants. Different disinfectants have different target ranges, not all disinfectants can kill all microorganisms. Some methods of disinfection such as filtration do not kill bacteria, they separate them out. Sterilization is an absolute condition while disinfection is not.

Topic 2: Setting up the workplace

Workplace preparation is a key point in terms of veterinary intervention. Its setting up depends upon different factors; some of them are here listed:

1. Types of the interventions to be done;
2. Kind of animal species on which the operation has to be done;
3. The place at which intervention has to be done: at farm, clinic, etc.
4. The materials to be used, etc.

3.3. Clean the floors, benches and other flat areas

Topic 1: **Important of cleaning of flat areas: (** Floors Walls, Ceiling, Shelves, Counters, Tables Benches**)**

Keeping your workplace clean means having a systematic and thorough approach to keep working and storage areas clean, sanitized and free from garbage and pests. It also means following hygienic practices for handling equipment and disposing of waste or garbage. All of this is necessary to prevent or minimize the risk of cross-contamination of harmful bacteria, chemicals or even disease. This would pose significant safety hazards for customers and staff

Important of cleaning of flat areas

- **Floors:** The complete floor, including all edges, corners, and main floor space, should have a uniform finish or shine and be visibly clean, with no blood and body substances, dust, dirt, debris, or spillages**.** Working floors need to be swept or vacuumed and washed at the end of every working day, as dirty floors attract vermin and pests. Floors in the equipment and dry stores should be swept daily, and washed at least once a week.

- **Walls**: All wall surfaces, including skirting, should be visibly clean, with no blood and body substances, dust, dirt, debris, adhesive tape, or spillages
- **Tables**: All parts of the table (including wheels, castors, and underneath) should be visibly clean, with no blood and body substances, dust, dirt, debris, adhesive tape, stains, or spillages

Topic 2: Procedure of cleaning:

- ✓ Cleaning is a process which will remove soil and prevent accumulation of residues which may decompose or support the growth of disease causing organisms or the production of toxins.

The cleaning operation:

- ✓ **Prewash (Clear the floor and flat areas)** - the removal of gross particles before applying the cleaning solution. This may be accomplished by flushing the equipment surface with cold or warm water under moderate pressure. Very hot water or steam should not be used because it may make cleaning more difficult.
- ✓ **Washing (Sweep or vaccum)** - the application of the cleaning compound. There are many methods of subjecting the surface of equipment to cleaning compounds and solutions. Effectiveness and the economy of the method
- ✓ **Rinsing (Mop the floor and flat areas)**- the removal of all traces of the cleaning solution with clean potable water.
- ✓ **Sanitization** (**Buff the floor and flat areas**) generally dictate its use.
  The process is performed either by using heat or a chemical concentration that will reduce the bacterial count, including pathogens to a safe level on utensils and equipment after cleaning.

3.4: clean the livestock shelters

Topic 1: Tips of cleaning the livestock shelters:

Keeping your shelter clean and disinfected is vital to the health and wellness of the animals in your care

Hygiene in Animal Housing Good housing is an integral part of human and animal welfare. Scientific housing of animals is essential for obtaining maximum benefits from livestock and birds in respect of their productivity and services to the mankind. Housing is an important activity of all modern animal welfare programs. A clean shelter also adds the benefits of increasing the comfort level of animal and presenting positive impacts on the health of the animal. Proper hygienic condition helps to avoid bacterial, viral, and parasitic infection and related illness in animals. Considering the kind of weather conditions and harsh climate, it is all the more important that animals must be in hygienic conditions as possible.

Protocols for animal house hygiene cleaning of animals and their environment:

Physical cleaning includes removal of urine, fecal matter and organic material from the animal body and the environment.

• Cleaning should be result in visible clean surface with clean, warm and soapy water.

• Daily cleaning of animals and farm help to avoid a number of diseases and it can also reduce the objectionable odor in shelters and the environment.

• For killing of harmful pathogens sanitation using potential disinfectant agent uses after cleaning which can remove harmful biological entities from the environment.

• Effective sanitation requires applying a germicidal agent to a basically clean surface. This requires use of both detergent and disinfectant products. Detergents in themselves do nothing to kill germs.

• Virtually all disinfectants used in shelters are inactivated by organic material such as feces, kitty litter, saliva, sneeze marks and plain old dirt to some extent, so if they are not applied to a clean surface, they simply will not work.

• Periodically, a stronger degreaser should be used to deal with body oils and other grunge that builds up in kennels over time and can render disinfectants ineffective. There is no single perfect disinfectant for use in all circumstances. It is important to consider the surface to be cleaned and the harmful microorganisms most likely to be present. Most disinfectants are effective against most bacteria, enveloped viruses and fungi. A clear understanding of the definition and function of different cleaning products is important to design an effective cleaning protocol.

Three types of product are generally used for environmental cleaning:

3.5- Perform waste disposal

The generation of wastes may present threats to the environment and public health, but this depends on the type of waste management option and the way it is controlled. Waste is a complex mixture of different substances, only some of which are intrinsically hazardous to health.

Topic 1: Classification of waste

In general, wastes are classified into biodegradable and non-biodegradable wastes.

1. Biodegradable

Biodegradable waste is a type of waste which can be broken down, in a reasonable amount of time, into its base compounds by microorganisms and other living things regardless of what of what those compounds may be. The main environmental threat of biodegradable wastes is the production of methane. wastes can be used for composting or a resource of heat, electricity or fuel by means of incineration or anaerobic digestion, production of energy in the form of biogas.

2. Non-biodegradable

This is the type of waste that cannot be broken down into its base compounds by microorganisms. They constitute a problem by overwhelming landfills thus, recycling then be a good management.

Topic 2: Hazards from waste

Biomedical waste consists of solids, liquids, sharps, and laboratory waste that are potentially infectious or dangerous. It must be properly managed to protect the general public, specifically healthcare and sanitation workers who are regularly exposed to biomedical waste as an occupational hazard. Biomedical waste differs from other types of hazardous waste, such as industrial or municipal waste, in that it comes from biological sources or is used in the diagnosis, prevention, or treatment of diseases.

1. Zoonosis (zoonotic diseases)

Zoonotic diseases are diseases carried by animals which can be transmitted to humans. In small animal veterinary practice, there are a number of these which must be guarded against.

Exposure to some micro-organisms can result in severe infections, allergies or toxic effects. Biological agents can cause three types of disease: infections, allergies, and poisoning (or toxic) effects.

Pathogenic micro-organisms can enter the human body by penetrating damaged skin, or by settling on mucous membranes. They can also be inhaled or swallowed, leading to infections of the upper respiratory tract or the digestive system. Whenever people are in contact while working with natural or organic materials like soil, clay, plant materials or substances of animal origin (fur, blood and other body fluids or excrement), they may be exposed to biological agents. Anyone exposed to these organisms in a veterinary environment is also at risk.

2. Toxics

There are many hazardous substances which must be used in veterinary practice including animal medications, anesthetics, sterilizing chemicals, cleaning products and solvents. Injuries caused through accidental exposure to hazardous substances include poisoning of specific organs or of the whole body, chemical burns, eye irritations, respiratory problems and skin conditions such as contact dermatitis. Long term exposures can in some cases lead to the development of cancers. Many chemicals are now known to be carcinogens, or cancer-producing substances.

3. Traumatic

'Sharps' include syringes used to inject drugs, to take samples of body fluids (such as blood for testing), and to tranquillize or anaesthetize animals in veterinary practice. They are also used in euthanizing animals. Other sharps in veterinary practice include scalpels used in surgical procedures. These, like syringes, present significant health risks if not handled and disposed of with great care. They may be contaminated with animal blood and other body fluids, or with unknown substances.

Sharps must always be disposed of into a clearly labeled and appropriate sharps container. The container must be puncture resistant and leak proof. It must have a lid or top which can be securely closed, and must carry a "**biohazard**" label. These should be replaced when they are only three-quarters full, to prevent people from forcing used sharps into a near-full container and risking injury. Sharps should be placed in the containers using tongs or tweezers – not with the fingers.

Topic 3: Waste management purpose

Hazardous substances must be stored securely and labeled clearly. A number of the substances used in veterinary practice must be kept in locked storage and accessed only by veterinary practitioners. While

access to the chemicals and drugs used for animal treatment will be limited to trained veterinary staff, you may be asked to use solvents, disinfectants and cleaning chemicals to perform routine tasks. These too are classed as hazardous substances, and you may need to wear gloves and other PPE to carry out cleaning tasks.

Waste management equipment and tools

Biomedical waste is treated by any or a combination of the following methods: incineration or steam, chemical, or microwave sterilization. Any tools or equipment that come into contact with potentially infectious material and are not disposable or designed for single-use are sterilized in an autoclave. Disposing of these materials with regular household garbage puts waste collectors at risk for injury and infection, especially from sharps items. Programs should be in place for the disposal of household biomedical waste.

For small-scale initiatives, minimal requirements typically call for the incineration, encapsulation and/or safe burial of biomedical wastes, considering the context. Other more efficient and/or more sustainable methods of treatment and disposal of biomedical wastes exist (such as chemical disinfection, wet thermal treatment, and microwave irradiation).

Topic 4: Waste management specifications

Clinical Waste should be removed from its place of origin for storage prior to collection. The waste should not be allowed to accumulate in unsuitable places such as corridors. If waste is likely to present a risk due to its infectious or hazardous nature or become offensive, then it should be removed to storage as soon as possible.

- **EMS (Environmental Management System)**

Environmental and health and safety training (including first aid measures, good hygiene practices, and the use of protective clothing and equipment) are essential, as is the assignment of specific tasks and responsibilities for the management of biomedical wastes (including its segregation, collection/handling, storage, transportation, treatment, and final disposal, as well as accident, spill, and emergency response).

In practice arrangements for managing clinical waste are based on categorisation of waste into groups which present different hazards. These groups do not set out a hierarchy of the relative level of risk from the clinical waste; the actual level of risk varies within the groups.

Waste group	Type of clinical waste
Group A	Includes the following items: blood, animal carcasses Soiled surgical dressings, swabs and other similar soiled waste. Waste materials, for example from infectious disease cases, excluding any in groups B-E
Group B	Discarded syringe needles, broken glass and other contaminated disposable sharp instruments or items.
Group C	Microbiological cultures and potentially infected waste.
Group D	Drugs or other pharmaceutical products.
Group E	Items used to dispose of urine, faeces and other bodily fluid secretions or excretions, which do not fall within group A.

Topic 5: Disposal techniques and methods

The safe disposal and subsequent destruction of clinical waste is a key step in the reduction of illness or injury through contact with this potentially hazardous material, and in the prevention of environmental contamination. There are three common methods of waste disposal; these include burning, burying and recycling.

- **Burning or Incineration**

Incineration is the process that converts combustible materials into noncombustible ash, achieving a reduction of 90% by volume or 75% by weight. The product gases are vented into the atmosphere, and the treatment residue may be disposed of in a landfill.

- Burying or Landfill

It is acceptable to dispose of specific categories of waste in a properly managed landfill provided there are procedures in place to protect workers from contact with the waste. Studies have shown that bacteria and viruses in a landfill are significantly reduced in number by processes such as thermal inactivation and adsorption of organic material in the solid waste.

- Waste recycling

Some wastes may be collected and sent to recycling centers and they are reused; this may be useful because the virgin resources are saved, the landfill spaces are reduced and the quantity of CO_2 resulting from combustion is reduced.

Topic 6: Disposal of expired and unwanted drugs

In general, expired pharmaceuticals do not represent a serious threat to public health or to the environment. Improper disposal may be hazardous if it leads to contamination of water supplies or local sources used by nearby communities or wildlife. Expired drugs may come into the hands of scavengers and children if a landfill is insecure.

- ✓ Contamination of drinking water must be avoided.
- ✓ Non-biodegradable antibiotics and disinfectants should not be disposed of into the sewage system as they may kill bacteria necessary for the treatment of sewage.
- ✓ Burning pharmaceuticals at low temperatures or in open containers results in release of toxic pollutants into the air. Ideally this should be avoided.
- ✓ In the absence of suitable disposal sites and qualified personnel to supervise disposal, unwanted pharmaceuticals present no risk provided they are securely stored in dry conditions.

3.6 Store cleaning/sanitizing equipment, tools and chemicals

Topic 1: Storage of cleaning equipment and chemicals:

Clean supplies and PPE must be stored in a separate area from soiled items and cleaning processes. Chemicals may be arranged according to their groups and respect of conditions given by manufacturers.

- ✓ Store cleaning supplies in an area that is clean and free of debris. Make sure that there aren't any temperature extremes in the area where your cleaning supplies are stored. Another thing to make sure of is that the area is dry.
- ✓ Keep cleaning supplies in their original containers. If you mix your own cleaners, make sure you use new clean bottles and label them to avoid a mix up. Some cleaners can cause a lot of problems when they are mixed, so always follow manufacturers' instructions.
- ✓ Be sure to keep your cleaning supplies stored in places where children and/or pets will not be able to get to them.
- ✓ Store chemicals in their originally labeled containers and make sure they are closed properly.
- ✓ Never store chemicals near food, food storage areas or any tools or equipment that will touch food.
- ✓ Always read the instructions on the label before use, even if it’s a product you use regularly. You don’t want to accidentally use the product in the wrong area or use it incorrectly.

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