

Problems On Veterinary Vaccine And Its Solution Western Hararghe

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Abstract: Livestock production constitutes one of the principal means of achieving and improving living standards in many regions of the agricultural productive system in Ethiopia. As in many other countries, livestock plays multiple roles in Ethiopia being a major natural source of food, industrial raw materials, export earnings and form an integral part of agriculture production system. Cattle production in Ethiopia, as well as in Western Hararghe zone, however, is constrained by a number of factors including malnutrition, disease, improper health care and other management problems. Among the serious constrains to livestock production in West Hararghe zone is the high prevalence of various disease, mainly of bacterial, viral, protozoal, fungal and parasitic origin. The least cost method to restore health and productivity in perspectives of disease should focus to preventive medicine. In Western Hararghe zone context good managements and vaccination is the priority. But veterinary vaccinations there is so many problems, such as shortage of knowledge about the vaccines how to store, transport and how to vaccinate the animals. The absence of trained person on handling vaccines or importance of good vaccine storage and transportation techniques. We store vaccine in the refrigerator normally but when the electric power is cut off there is no any action taken to solve the problems (there is no backup system) especially on woreda. Vaccine which purchased expensively does not used properly. This causes economic impacts on farmers who vaccinate their animals and impacts on government budget. To solve this problem the training should have to be giving to all concerned body and fulfill material that used for storage and transporting of vaccine.

[Seid U, Ahmed M. **Problems On Veterinary Vaccine And Its Solution Western Hararghe.** *Researcher* 2017;9(11):47-56]. ISSN 1553-9865 (print); ISSN 2163-8950 (online). <http://www.sciencepub.net/researcher>. 7. doi:[10.7537/marsrsj091117.07](https://doi.org/10.7537/marsrsj091117.07).

Key word: livestock, Vaccine, Disease, Hararghe.

Introduction

Livestock production constitutes one of the principal means of achieving and improving living standards in many regions of the agricultural productive system in Ethiopia (1). In Sub Saharan Africa livestock plays a crucial role in economic development of the countries and living standard of rural communities by serving as source of income up to 85% GDP and food. Export of live animals and animal products make substantial contribution to the foreign exchange earnings of many countries (ILC, 1998). As in many other countries, livestock plays multiple roles in Ethiopia being a major natural source of food, industrial raw materials, export earnings and form an integral part of agriculture production system (3).

Ethiopia is one of the few countries in the world with high livestock potential. The livestock population of the countries comprises about 57.8 million of cattle, 28.9 million of sheep, 29.7 million of goat, 10 million of equines, 1.2 million camels, 60 million poultry and immense bee and fisheries. This population ranked Ethiopia, first from Africa and ninth from the world in livestock population. However production efficiency of cattle is low in Ethiopia despite their large population. Also; their productivity is low due to

various constraints such as diseases, poor nutrition, poor management practices and low productive performance of the indigenous breeds (2).

Many diseases out breaks could be minimized or prevented with proper management and nutritional practices (4). Regarding to ILA (5), Good management practice can decrease major costs due to treat and increase feed efficiency, moreover good breeding and feeding practices can accelerate the growth of animals through shortening the period from birth to marketing or to reproduction and through increasing efficiency of conversion of feed to milk or meat, However; there practice of increasing efficiencies can expose animal to disease.

In Western Hararghe livestock crop mixing agriculture is common. This implies that even any crop cultivation in Hararghe gives priority to their livestock. This is because of high economic importance of livestock in the area. For instance in Hararghe crop production is not enough for population's food, due to overcrowded density of population (Land holding size of zone is 0.25hek/hh) and uneven distribution of rain in the area. Therefore, they livestock are used as food gap filling commodity and dominant cash source. The economic importance of disease also thought from how it challenges the

livelihood of the community. Cattle production in Ethiopia, as well as in Western Hararghe zone, however, is constrained by a number of factors including malnutrition disease, improper health care and other management problems. Among the serious constraints to livestock production in West Hararghe zone is the high prevalence of various disease, mainly of bacterial, viral, protozoal, fungal and parasitic origin. The economic process of livestock production starts from household to National level. However, one can generalize in the following key points.

As livestock production is a specific example of physical transformation process, disease can impair this process in variety of ways. Destruction of basic resources (death of breeding and productive animals);

✓ Reduction of the physical output of a production process or its unit value (e.g., lowered milk yield or quality);

✓ Lowering of the efficiency of the production process and the productivity of resources used (e.g. Reduced rates of growth or feed conversion); and has wider effects, including:

✓ Lowering the suitability of livestock products for processing, or generating additional costs in the distribution chain (e.g., warble-fly larval damage to hides; drug residues);

✓ Affecting human well-being directly (e.g., zoonotic infections such as salmonellosis and brucellosis);

✓ Generating more diffuse economic effects that reduce the value of livestock to society (e.g., constraints on trade and tourism; concern for poor food quality especially, protein deficiency in the community).

Thus, there is a loss of efficiency, which poses both technical and socioeconomic problems. The concept of efficiency loss is therefore a relationship, not a number, and is smaller under low input, low-output production systems than under more intensive systems. It follows, therefore, that the potential economic importance of disease varies between farms to farms and systems to systems. The control measures may also be justified in one situation, but not in another. If restoration of technical efficiency is the goal, the corresponding economic objective is to find the least cost method to restore health and productivity. Anyhow, the least cost method to restore health and productivity in perspectives of disease should focus to preventive medicine. In Western Hararghe zone context good managements and vaccination is the priority. But veterinary vaccinations there is so many problems, such as shortage of knowledge about the vaccines how to store, transport and how to vaccinate the animals, e.g. on NCD and so on.

Therefore, the objectives of this paper were:

1. To identify problems on the veterinary vaccines in Western Hararghe Zone. These problems were studied during field works on all woredas of our zone.

2. To identify the impact of these problems,

3. To identify the solution for those listed problems.

4. To prepare manual training for animal health workers.

Common Problems On Veterinary Vaccines

➤ The absence of trained person on handling vaccines or importance of good vaccine storage and transportation techniques.

➤ Even we store vaccine in the refrigerator when the electric power is cut off there is not any action taken to solve the problems (there is no backup system), specially on woreda or veterinary clinics,

➤ Some animal health professions when they brought vaccines from Hirna Regional veterinary laboratory to the woreda they delay to put the vaccine in the refrigerator.

➤ The physical surrounding of vaccine storage is not maintained as free of dust and dirt.

➤ There is a problem on maintaining a clean environment which requires a regular routine of cleaning shelves and a daily cleaning of floors and working surfaces.

➤ There is not a regular schedule for checking and cleaning the refrigerator.

➤ There is not Separate damaged or expired vaccines from the usable stock without delay and dispose using established disposal procedures

➤ The stock holder not report to appropriate body for redistribution of vaccines with near expiry date. So many vaccines were expired in stock specially type "A" vaccine. This causes economical crisis of the country.

➤ In some veterinary clinics there are not shelves and tables. So vaccines and other drugs stored on the floor.

➤ There is not sufficient empty space which demarcates vaccines from the drug.

➤ In some veterinary clinics vaccines stored in places where is not protected from direct sun light and heat which is entered by windows.

➤ The absence of free air circulation by opening windows, which can be considered to reduce the effects of humidity.

➤ Some professionals store vaccines directly on the floor.

➤ The absence of wall thermometers, hygrometer and other equipment in order to regulate the temperature and humidity of storage areas.

➤ Expired vaccines are not removed from the stock and returned to the vaccine supply source/manufacture.

➤ Sometimes **live vaccines** wrongly transported from the woreda to the different site of veterinary clinics by holding vaccines in plastics. This is strictly forbidden (Must be transported in ice box).

➤ There is no enough knowledge about the vaccines being dispensed (common use, usual dosage, precautions about the method of use, common side effects, common interactions with other drugs and storage condition)

➤ Shortage of skills in assessing the quality of preparations and use

➤ Shortage of refreshment training on the handling and using of vaccines.

➤ Faulty & inadequate training & education of animal health graduates especially on private colleges.

➤ In all Woredas in the Western Hararghe, all animal population was not vaccinated at the same time under the same type of vaccines. (Only some animals vaccinated from one village or from one kebele). Even if all animal populations are under risk.

The Impact Of Listed

Problems:

Vaccine which purchased expensively does not used properly. This causes economic impacts on farmers who vaccinate their animals and impacts on government budget

➤ It causes for death of many animals (By giving a vaccine which is not properly handled, stored and transported) which is seen in different woredas of West Hararghe Zone.

➤ It spreads new disease in the area.

Solution For These Problems

Training of all veterinarians and assistances.

This is first by giving TOT (training of trainer) for one DVM from all Woredas on zone. Then trained person also train all animal health assistance on woreda stage.

Training of all farmers who participate on animal production

All animal health assistance in the woreda have responsibility to train the farmers on the advantage of the vaccines, what is happen if they are not vaccinate their animals, the time of vaccination.

Training of Woredas political leaders with Veterinarians

Some political leaders on woreda level (woreda administrator and woredas Livestock and fisheries resource development office leaders) will be trained with veterinarians on Zone stage. This will help the political leaders to understand the impact of veterinary vaccines and how to care the vaccine. These will helps

political leaders to give attention to this work and to helps this works by materials like care for transporting vaccines when needed and budget for this works.

Full filling materials which is needed for vaccination

Materials which are needed to transport vaccines and to store vaccines such as refrigerator, ice box, vaccine syringe, needles, vaccine reconstitute bottle and antidote drugs must be fulfilled. Vaccines should not be transported by public cars. It should be transported by office cars exactly in proper time for its safety. Veterinary vaccines which are manufactured by NVI (National Veterinary Institution) will need additional study by knowledgeable peoples on its clarity. So we have to recommend them. Because we face different problems in different woredas of our zone especially on Bovine pasteurellosis even if almost all needed precaution is fulfilled. Practical Training Manual of Animal Health Workers on Veterinary Vaccines.

General Description Of Vaccines

What is a vaccine?

A vaccine is a manufactured compound that is designed to help animals fight against particular diseases caused by specific bacteria and viruses. It contains materials called antigens that stimulate the body's defenses to produce either antibodies or activated cells that in turn modify or inactivate the agents of disease while vaccination is the introduction of a vaccine into the body to produce immunity to a specific disease. The vaccine may be administered by subcutaneous, intradermal or intramuscular injection, by mouth, by inhalation or by scarification.

Each vaccine also contains a component called an *adjuvant* that stimulates the animal's immune system. It is this component that causes animal to form where the vaccination was given; this property contributes to the adjuvant's ability to stimulate the animal's immunity over a sustained period of time. Vaccines may contain live viruses (though these are modified to reduce their potential harmful effects), killed viruses, or inactivated bacterial cultures or toxics. Through regular usage, vaccines are designed to reduce the incidence and/or severity of a specific disease. Few vaccines can completely prevent disease occurrence. However, when used properly, their beneficial effects far outweigh their drawbacks.

Types Of Vaccine

Vaccines are usually prepared in different forms, mainly live vaccine, killed vaccine and toxoid vaccines.

Killed vaccines

Killed vaccines are produced by inactivating the infectious agent (so that it can't replicate in the host) without altering the immunogenicity of the protective protein (s). They induce predominantly humoral type

of immunity, i.e. antibody-mediated. Generally they require two doses with an appropriate interval. These vaccines contain adjuvants that enhance the immune reaction. Booster doses of inactivated vaccines are often administered annually e.g. black leg, pasteurellosis.

Live vaccines

This type of vaccine could be prepared either by using less virulent or by attenuating highly virulent strain/type of an infectious organism. Attenuation is usually made by growing of an infectious organism under abnormal culture condition. These types of vaccines induce complete type of immune response (both humoral and cellular) and confer higher level and longer period of protection than killed vaccines. Live vaccines especially attenuated ones may revert to full virulence after inoculation into an animal and elicit disease e.g. PPR, rinder pest, lumpy skin disease.

Toxoid vaccine

Toxoid vaccines are toxins obtained from microorganisms and heat or chemical treated to destroy their deleterious properties without affecting the ability to stimulate the formation of antibodies.

Routes Of Vaccination

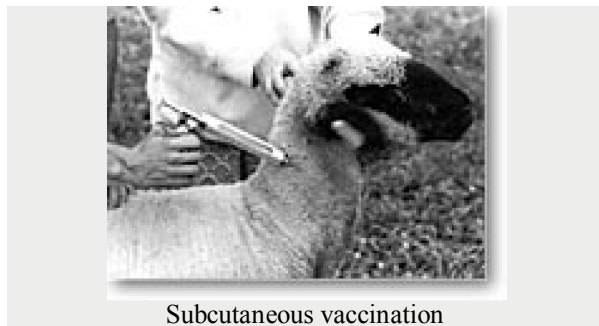
The site and route of administration may vary depending on the vaccine. Most vaccines are administered by under-the-skin (subcutaneous) injections. A few are administered intramuscularly, and occasionally some are given topically (e.g., soremouth vaccine) or intranasal.

Subcutaneous injection (S/C)

Subcutaneous injection is particularly convenient in small companion animals where the loose skin at the back of the neck is a commonly used route. Potential disadvantages are slower uptake of antigen as compared to a more vascular site such as muscle. Lower antibody response has been obtained with the S/C rout as compared to intramuscular injection.

Intramuscular injection (I/M)

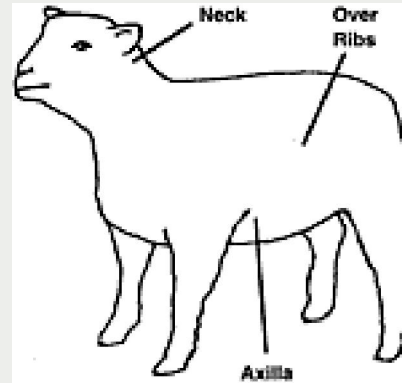
This rout deposits vaccine in to location of high vascularity and provides efficient exposure of antigen to the immune system. Attention must be paid to the anatomical choice of vaccination site to ensure adequate delivery and exposure to responsive cells.



Subcutaneous vaccination



A 1/2-inch needle for subcutaneous injections



Sites for subcutaneous vaccination

Intradermal injection (I/D)

Intradermal injection is very efficient immunizing route due to antigen capture and lymphatic draining to regional lymph nodes. Smaller doses of antigen are required to achieve responses equivalent to I/M injection.

Oral route

This route offers a convenient, powerful route for stimulating local immunity. Mass oral vaccination via drinking water has been used primarily in poultry.

Intranasal vaccination

Intranasal vaccination is an alternative mucosal route and has been advocated as a means of avoiding interference from maternal antibody.

In ovo vaccination

Chickens develop immunological responsiveness well before hatching, and early protection against infection, such as Marek's disease, infectious bronchitis, infectious Bursal and Newcastle disease has been demonstrated.

Age At Vaccination

The main obstacle to successful vaccination in young animals is the presence of blocking level of maternally derived antibody, therefore, all vaccination schemes, whether they are for an individual animal or for a herd health vaccination program must be planed considering the presence and extent of maternal antibody.

Dam vaccination

Dam vaccination schemes are especially beneficial for the protection of neonates in heavily contaminated environments. The strategy is to enhance neonatal immunity by augmenting colostral titers.

Vaccination of the dam, with a second dose just prior to parturition, maximizes colostral antibody titers, examples of such approaches are E. coli, rota and corona virus vaccines in cows and heifers.

Strategies for vaccine use

Use the vaccine's label as a guide regarding how and when to give that particular product. Vaccines should be given at strategic times of the year or season. These times vary depending on the vaccine and particularly on the disease which you are trying to control.

Epidemiology

Strategies for the use and measurement of the success of vaccination in the control of animal disease have to be considered in the context of epidemiology

of that specific disease. Among the animal diseases, which are not ubiquitous in nature, could be successfully controlled. They should also show a high case-fatality rate and if recovered, animals show long-lasting immunity. Persistent infections are uncommon, and the cycle of transmission can therefore be readily broken.

Recognized infectious diseases, those need vaccinations in west hararghe zone.

i. List "A" Diseases

Includes LSD, PPR, NCD, FMD --- in limited areas and camel pox.

ii. List "B" Diseases

Includes Black leg, Bovine pasteurellosis, Ovine pasteurellosis and Anthrax .

Time schedule of vaccination in all woredas of western hararghe zone

List "A" Vaccine

| Types of vaccine | LSD | PPR | FMD | NCD | Rabies | Camel pox |
|------------------|----------|-----------|----------|--------------------------------------|---------|-----------|
| Schedule | May-july | Jan-March | Sept-Nov | Jun-Aug After this every 4 months | Jun-Aug | Sep-Oct |

List "B" Vaccine

| Types of vaccine | Black leg | Pasteurolosis (Both) | Anthrax | Parasite Disease | Poultry coccidiosis vaccine |
|------------------|-----------|---|-----------|------------------|-----------------------------|
| Schedule | Nov-Feb | 1 st – Sep-Nov, 2 nd – Mar-May | June-July | jul-Aug & March | |

NB- FMD- 1st vaccination: - 2 injections at 6 months interval, then revaccinate 1 year after 2nd injection, every year. i.e. in the month of Sep-Nov.

Source: - Hirna Regional Veterinary Laboratory.

Causes Of Vaccine Failures

Maternal antibody interference

Very young animals receive antibodies from their mothers when they nurse that protect them from disease. While these antibodies are present, vaccination will not be effective. These antibodies generally disappear from the body at 12-14 weeks of age. Booster shots are timed to try and protect them when the maternal antibodies wane at that time.

Certain drug therapies

For example, high doses of steroids are immunosuppressive and may interfere with vaccinations. The use of antibiotics may also interfere with vaccination.

Fever or hypothermia. Already debilitated, exposed or incubating disease Stress.

Vaccine being used is against wrong strain of disease agent.

Vaccine inappropriately administered Improper storage of vaccine.

Improper route of administration.

Disinfection of skin or needles.

Improper vaccination intervals (too often or too long).

Precaution And Contraindication Of Vaccines

When using vaccines as one of your management tools, it is important to consider all the potential

reasons a vaccination program may fail to prevent disease on animals. Being aware of the potential problems that can arise will allow a more effective (profitable) means of disease control in animals.

✓ Sick animal is shouldn't be vaccinated.

✓ Animals under immunosuppressive drug treatment should not be vaccinated within three to four weeks,

✓ Care should be taken in the use of antibiotics when a vaccine containing live bacteria is administered.

✓ During mass vaccination of multiage group with live vaccines the transmission of infection due to the organism in the vaccine it susceptible young animals should be considered.

✓ The full vaccination course as recommended by manufacturer should always be administered.

✓ Stressed animal should not be vaccinated.

✓ Don't vaccinate through dirty, wet skin.

✓ Avoid repeated use of needle and syringe within herd/flock.

✓ Liquid preparations should always be adequately shaken before use to ensure uniformly of the maternal to be injected.

Vaccine Transport, Storage, And Handling How-To

The agents that make up vaccines have a limited shelf life. They are reliably effective only when handled as directed by the manufacturer. Following consistent storage and handling protocols helps ensure that the vaccines have the best potential of inducing an immune response when you administer them.

Transport

- Use an insulated cooler to transport vaccines.
- Keep a thermometer in the cooler.
- Maintain the temperature between 2°C–7°C.
- Use refrigerated or frozen packs as needed to maintain the appropriate temperature in the cooler.
 - Place insulation (e.g., bubble wrap) between the vaccine vials and the frozen pack to prevent direct contact.
 - Keep the vaccines in their original packaging.
 - To minimize exposure to extreme temperatures, keep the cooler in the interior of the vehicle instead of the trunk or truck bed.

Storing Vaccines

- Always read and follow manufacturer label directions for storage.
 - Do not store vaccines in bins or drawers in the fridge. Temperatures often vary in these areas.
 - Measure and log the temperatures regularly in refrigerators used for vaccine storage.
 - Clean and defrost the refrigerator regularly.
 - Rotate stocks when new shipments arrive — use a "first in, first out" system.
 - Discard vaccines that have reached their expiration date.
 - Keep vaccines in a standard-size refrigerator with a separate freezer compartment.
 - Keep a good-quality thermometer in the vaccine storage refrigerator.
 - Maintain the refrigerator between 2°C–7°C.
 - Do not store vaccines in a mini dormitory-style refrigerator.
 - Do not over pack the refrigerator.
 - Store vaccines in their original packaging.
 - Stack vaccines by type, and rotate the stock so that the batch with the earliest expiration date is used first.
 - Record the temperature twice daily on a log sheet.
 - If the temperature is above or below the recommended range, notify the supervisor and call an appliance repairperson if necessary.
 - Store jugs of water in the vaccine refrigerator to help maintain steady temperatures.
 - Check the refrigerator seals regularly.
 - Make sure all staff members close the refrigerator door tightly after opening.
 - Do not store food or beverages in the vaccine refrigerator.

- Mark the refrigerator's electrical outlet with "do not unplug" signs.

Preparing Vaccines for Use

- Always read and follow manufacturer label directions for preparing vaccines.
 - Reconstitute vaccines with the proper diluents (liquid portion) at the correct volume.
 - Prepare only what you will use immediately.
 - Do not reconstitute and store vaccines for later use.
 - Do not leave reconstituted vaccines on icepacks.
 - Discard any unused vaccines.
 - Use sterile technique, including using a new needle and syringe for each animal, (if it is possible).
 - Protect from sunlight.
 - Do not mix different vaccines.
 - Do not split doses even if the animal is very small. Vaccines are meant to be dosed in a full dose.
 - Clean up any spills with bleach or alcohol.

Administering Vaccines

- Vaccinate in teams: having two people checking that the correct vaccine is drawn up, administered, and logged on the animal's record reduces the opportunities for mistakes. Two people also allow for safe handling of the animals being vaccinated.
 - Give by proper route: subcutaneous injection, intranasal, etc. Administering by the wrong route can have serious consequences. For example, an intranasal vaccine that is injected subcutaneously can cause liver damage.
 - Use sterile technique, including using a new needle and syringe for each animal. (if it is possible).
 - Administer a full dose.
 - Clean up spills with bleach or alcohol.
 - Dispose of used needles, syringes, and vials in appropriate containers.
 - Report mistakes.

Documenting Vaccines

- Record the vaccine information on the animal's record.
 - Vaccines come with labels you can stick directly to the paper record that show the type of vaccine, manufacturer, serial number and expiration date.
 - In addition to the product information, be sure to record the date, name of person administering, the dosage volume, and the site of administration (right forelimb, right rear limb).
 - Good documentation is extremely helpful if a problem occurs that you think may be related to a vaccine.

General

- Designate primary and backup personnel to be in charge of vaccine inventory, storage, and handling.
- Maintain a vaccine inventory log that notes the vaccine's quantity, manufacturer, brand, lot number, expiration date, date of arrival, and arrival condition.
- When a shipment arrives, check the temperature inside the shipping box and immediately refrigerate the vaccines.

- Use only the diluents supplied with the vaccine.
- Do not reconstitute or draw up the vaccine into the syringe until it is needed.
- Avoid mixing different vaccines in the same syringe unless licensed for that use.
- Properly dispose of syringes and needles in a sharps container.

Common Veterinary Vaccines

Anthrax vaccine

| Indication | For prevention and control of anthrax in domestic animals |
|---------------------------|---|
| Presentation | The freeze-dried vaccine is available in 20 ml vial of 100 doses. |
| Dosage and administration | Reconstitute the product in 100 ml of sterile saline water. Cattle and equines: 1 ml SC in the loose skin of the neck. Sheep and goats: 0.5 ml SC. |
| Booster | Vaccination should be carried out every year before the anthrax season. |
| Immunity | Develops in 10 days and lasts for one year. |
| Side-effect | Swelling at the injection site. It normally disappears in 2-3 days. |
| Precautions | Inject SC only and animals above 3 months of age. Pregnant animals should not be vaccinated. Antibiotic should not be given shortly before and after 14 days after vaccination. |
| Withdrawal period | Meat – for 6 weeks after vaccination |
| Storage | Store it in the refrigerator at 4 ⁰ c. |

Bovine Pasteurellosis vaccine (hemorrhagic septicemia)

| Presentation | The vaccine is liquid suspension available in vial of 100ml for 50 doses |
|---------------------------|---|
| Dosage and administration | For best results vaccinate animals at least 21 days before the hemorrhagic septicemia season. Shake the product vigorously before use: inject adult and calves with 2 ml SC. |
| Immunity | Immunity appears in 10 days after vaccination and lasts for 6 to 8 months. Revaccination is advised after 6 months. |
| Side-effect | Anaphylactic reactions may appear occasionally after vaccination, particularly on animals, which have been vaccinated many times against FMD, Blackleg or Anthrax. In cases of reaction, immediate injection of antihistamine is recommended. |
| Storage | At room temperature for 6 months; at +4 ⁰ c for one year; avoid light and heat. |

Blackleg vaccine

| Indication | Control or prevention of blackleg disease in cattle. |
|---------------------------|--|
| Presentation | It is a liquid suspension vaccine available in 100 ml vials for 50 doses. |
| Dosage and administration | Shake the product vigorously before use and vaccinate cattle including calves; inject 2 ml SC. |
| Booster | Every year in endemic areas. |
| Immunity | Immunity develops in 10 days after vaccination. |
| Storage | At +20 ⁰ c for 6 months; +4 ⁰ c for 1 year. Avoid light and heat. |

Contagious Bovine Pleuropneumonia (CBPP) Vaccine

| Indication | For the control or prevention of CBPP in cattle. |
|---------------------------|---|
| presentation | The freeze-dried vaccine contains 100 doses per vial. |
| Dosage and administration | Reconstitute the vaccine in 100 ml of cold and sterile saline water. Inject 1 ml of the reconstituted vaccine subcutaneously only. Vaccinate all animals above 6 months of age. |
| Booster | Annually |
| Immunity | It develops 3 weeks post-vaccination. |
| Side-effect | A rare case of post-vaccinal reaction (mild swelling at the site of injection) can occur. If it occurred, antibiotics like Tetracycline, Oxy TTC, Erythromycin and Tylosin can be used. |
| Precautions | The reconstituted vaccine must be protected from light and heat and used immediately (the maximum limit is 1 hour when kept under cold condition). |
| Storage | At +4 ⁰ c for 6 months; at -20 ⁰ c for several years. |

Contagious Caprine Pleuropneumonia (CCPP) Vaccine

| | |
|----------------------------------|--|
| Indication | To control or prevent CCPP in goat. |
| presentation | The vaccine is in liquid suspension, which is available in 100 ml for 100 doses. |
| Dosage and administration | Shake the vaccine before use and vaccinate 1 ml/goat SC. |
| Immunity | CCPP vaccine confers immunity for 1 year. Revaccination should be made after a year. |
| Side-effect | Slight edematous reaction is induced by the adjuvant, saponin, which disappears in 48 hours. |
| Storage | The vaccine should be stored at +4 ⁰ c at least for 1 year. |

Ovine Pasteurellosis Vaccine

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|----------------------------------|--|
| Indication | Control or prevention of pasteurellosis in sheep. |
| presentation | The vaccine is in liquid suspension form and available in vials of 50 ml for 50 doses. |
| Dosage and administration | and Shake the product vigorously before use; vaccinate 1 ml/sheep SC. For best results vaccinate according to regional conditions, at least 3 weeks before the rainy season. |
| Immunity | Immunity appears in 10 days after vaccination and last for 6 to 8 months. |
| Precautions | Avoid light and heat |
| Storage | At +20 ⁰ c for 6 months, at +4 ⁰ c for 1 year |

Foot and Mouth disease (FMD)

| | |
|----------------------------------|--|
| Indication | Control or prevention of foot and mouth disease in cattle |
| Dosage and administration | and Shake the bottle before use and inject 4 ml/head of cattle SC, preferable in dewlap region. The first requires 2 injections at 6 months of interval. |
| Booster | Annually and consider the outbreak season. |
| Immunity | 2 to 3 weeks after vaccination and may last for 1 year. |
| Side-effect | Swelling may occur at the site of inoculation and persist for a few weeks. |
| Precautions | After puncture of the stopper the whole bottle of the vaccine must be used within 24 hrs. Don't vaccinate the cattle under 6 months of age. It is better not to associate other vaccination with FMD and not to make another vaccination 1 month before and after FMD vaccination. |
| Storage | Store at +4 ⁰ c. |

Peste des Petits Ruminants (PPR) vaccine

| | |
|----------------------------------|---|
| Indication | To control or prevent PPR in goat and sheep |
| presentation | 20 ml vial of 100 doses of lyophilized vaccine. |
| Dosage and administration | and Inject 1 ml of the diluted vaccine Subcutaneously. |
| Immunity | Immunity can develop 8 days after vaccination, immunity is lifelong. |
| Precautions | Immunization before 6 months of age should be avoided. Since parental acquired immunity can interfere with the vaccination. |
| Storage | Vaccine should be stored at -20 ⁰ c. |

Sheep and goat pox vaccine

| | |
|----------------------------------|--|
| Indication | To control or prevent sheep and goat pox. |
| presentation | 20 ml vials of 100 doses of lyophilized vaccine. |
| Dosage and administration | and Reconstitute 20 ml of the product in 100 ml of cool and sterile saline water and inject 1 ml of diluted vaccine at SC. This vaccine can be associated with freeze-dried anthrax vaccine. |
| Immunity | 8 days after vaccination and lasts for 2 years. |
| Storage | Vaccine should be stored at 20 ⁰ c. |

African Horse Sickness vaccine

| | |
|----------------------------------|--|
| Indication | To control or prevent African horse sickness in equine. |
| presentation | 20 ml vial of 20 doses of lyophilized vaccine. |
| Dosage and administration | and Reconstitute the product in 20 ml of cool and sterile saline water and inject 1 ml of diluted vaccine SC. |
| Immunity | Appears 1 month after vaccination and may last for 1 year. |
| Side-effect | Hypothermia can occur at 48 hrs or between 7 th and 14 th day after vaccination. |
| Precautions | Vaccinate animals above 6 months old. Vaccinated animals should be rested for 15 days after vaccination. The vaccine should not be frozen. |
| Storage | Vaccine should be stored at +4 ⁰ c. |

Avian coccidiosis vaccine

| | |
|----------------------------------|--|
| Indication | To avoid problems related to drug resistance and the continuous use of medication to control Eimeria species in domestic birds. |
| Dosage and administration | The vaccine is given in the drinking water as a single dose at between 5 and 9 days of age. A single dose is sufficient to protect broilers and replacement layer pullets. |

Fowl typhoid vaccine (live vaccine)

| | |
|----------------------------------|---|
| Indication | To control or prevent fowl typhoid in poultry |
| presentation | The vaccine is available in vials of 20ml with 100 doses |
| Dosage and administration | Reconstitute the vaccine in 50ml cool sterile distilled or saline water. Inject 0.2 ml of reconstituted vaccine by SC injection in to the lower parts of the neck. A single dose vaccine should be given at 6 weeks of age followed by a booster dose at 13 weeks of age. |
| Immunity | It appears in about 10 days. The vaccine confers protection for 6 to 8 months after the injection. |
| Storage | Vaccine can be stored at +4 ⁰ c for 6 months and at 20 ⁰ c for several years. |

New castle disease vaccine**Live vaccines****Lasota and Hinter B1**

Indication, is to control or prevent Newcastle disease in poultry.

Dosage and Administration:-Ocular route: use an eyedropper.

To calculate the volume of water required in ocular drop: Measure 1ml of water to the dropper; count the number of drops in this 1ml of water; calculate the volume of diluents required to dilute the number of doses of the vaccine per vial with the eyedropper in use.

Volume of diluents (ml) = No of doses of vaccine per vial / No of drops formed per ml

Example: how much diluents should be added to a vial containing 250 doses of NCD vaccine volume of diluents (ml) = 250 doses per vial / 50 dropper ml

= 5ml per vial given that 1ml of water in the eyedropper yielded 50 drops.

Oral drench; dissolve the 200 doses in 200 ml. The 100 doses in 100ml and 50 doses in 50 ml. administer by oral drench 1ml of dissolved vaccine squirting into the beak of each bird using a clean plastic syringe.

Drinking water: the quantity of water generally required per bird for the drinking water vaccination is as follows:

| | |
|-------------------------|---------|
| For 10-14 day old birds | 10-15ml |
| For 3-8 week-old birds | 20-30ml |
| For other birds | 40ml |

To calculate the volume of water required to dilute the vaccine, multiply the number of doses of the vaccine per vial by the amount of ml required per bird according to the above.

Example; to dilute 500 doses of vaccine for 8 week-old birds, multiply 500 by 30. That means one needs 15 liters of water to dilute the 500 doses of vaccine per vials.

Vaccination program: The parent flocks vaccinated but not infected, so their progeny could respond to vaccination from 14 days. Parent flocks recently been infected with virulent virus; in this flock, levels of antibody known to interfere with vaccination until 42 days. In situation of this kind, approximately 60% of birds will respond at about 21 days, while the remaining 40% are refractory until approximately 42 days.

While vaccination at one day of age may give active protection to chicks with lowest level of antibody, Vaccination at this age may be largely ineffective in the majority of chicks and hence should be regarded as preliminary step rather than a recognized protective procedure.

In the case of broilers in low risk areas, revaccination at 14 days of age will prove adequate protection. In high risk areas application of vaccine at this age only may be inadequate. Therefore, it must be necessary to revaccinate at 42 days of age using the lasota vaccine by the drinking water.

In the case of layers, further boosting of immunity is necessary after 10 weeks of age.

This is to protect the birds from the disease during the remainder of the growing period, and to provide at a point of lay an immune level that will effectively protect the pullets with the minimum of revaccination during the laying period.

If the time interval between the primary, and secondary vaccination is < 21 days, the antibody produced by the first dose of a vaccine is more likely to interfere with the multiplication of the second dose of the virus. An interval during which no further vaccine is given should be allowed until the final dose of vaccine is administered about two weeks before the birds come into egg production.

Therefore, the following vaccination program is recommended.

| Days of vaccination | Types of vaccine | Routes of administration |
|---------------------|------------------|----------------------------|
| Day old | HB1 | Intraocular |
| Day 21 | Lasota | Intraocular |
| Day 42 | Lasota | By the drinking water |
| Between 10 and 12 | Inactivated | (0.5ml/bird) Intramuscular |
| At point of lay | Inactivated | (0.5ml/bird) Intramuscular |

Precaution: The water used for reconstitution must be free from antiseptics. The chicken will not be given drinking water the evening before vaccination.

Storage: vaccine should be store at +4°C.

Inactivated oil emulsion Newcastle disease vaccine

| Indication | To control and prevent Newcastle disease in poultry |
|----------------------------------|--|
| Dosage and administration | The inactivated type of vaccine is recommended for flocks of lying and breeding birds. Shake well before and during use. Inject 0.5ml vaccine per birds Sc at the back of the neck or Im in the breast muscle. Only health poultry should be vaccinated. |
| Vaccination program | First vaccination should be given at 10-12 weeks of age. While second vaccination at point of lay. Best immunity is obtained when birds are vaccinated with live Newcastle vaccines prior to the application of inactivated vaccine. |
| Storage | Store the vaccine from +4°C -8°C until it is used. Allow the vaccine to reach the room temperature (20°C) before use. |
| Side-Effect | Accidental injection of this vaccine to the vaccinator can cause the localized reaction; in such occasion seek physician assistance. |

Rabies Vaccine

| Indication | Prevention and treatment of rabies in dogs and cats. |
|----------------------------------|--|
| Dosage and administration | Primary vaccination: dogs/cats at 3 months and cattle/horse at 6 months. 1ml SC or IM. |
| Presentation | Single dose or multiple doses at 10. |
| Booster | Every three years |
| Precaution | After SC administration, a nodule may occasionally occur. |
| Storage | +2 to +8°C: Avoid freezing. |

Acknowledge

Dr. YESAK YUSUF for his intellectual advice, encouragement and support.

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11/5/2017