

SAFETY PRECAUTIONS FOR ANIMAL HANDLERS AND VETERINARY PERSONNEL

Veterinarians are unavoidably exposed on a daily basis to risks of physical trauma, chemical hazards and biological threats that can harm their health, reduce their productivity and even shorten their career if not properly dealt with.

- (a) **Physical hazards:** These include animal bites, needle pricks, animal kicks, allergies falls (especially in abattoirs) etc.

Precautions: It is necessary for a veterinarian to understand the behaviour and temperament of animals he is handling. No animal should be trusted; hence to safeguard personnel from injuries, proper mouth guards or tape muzzle should be used in dogs, use of crush in cattle ranch, , appropriate towel to wrap cats (to avoid scratches) etc.

In case of falls from slippery floor of the abattoir, use of gum boots is advised.

- (b) **Chemical hazards:** these can be from noxious anaesthetic gases, cytotoxic and other toxic drugs/substances. Organophosphate used for fumigation. etc.

Precautions: Proper disposal of chemicals, use of goggles, protective clothing, hand gloves and nose mask when handling chemical and toxic substances.

It is also necessary to avoid radiations by always wearing lead jacket when using X-ray machine.

- (c) **Biological Hazards:** The most obvious being infectious/zoonotic diseases e.g. rabies, brucellosis, anthrax, salmonellosis, psittacosis, e.t.c.

Precaution: Protective clothing, adequate disinfectant and hygienic practices is recommended.

For workers working in a veterinary clinic, it is recommended that pre-exposure antirabies immunisation be administered annually. Also used needles and syringes should be properly disposed off, while empty vaccine bottles buried. Hand gloves should always be used when handling animals, laboratory coats should be regularly washed.

In poultry farms, measures must be taken to make washing of hands a habit after touching birds or treating them.

TYPES OF VACCINES AND IMMUNIZATION PROCEDURE

Definitions

Vaccines: these are suspension of attenuated or killed micro organisms (Viruses, Bacteria or Rickettsiae), administered for prevention of infectious diseases. They can provoke effective and often specific, long term immunity. They can also be defined as any biological agent used to produce active immunity. Vaccines are used in disease prevention and not curative. They are effective in disease prevention, control and eradication. The eradication of diseases such as small pox from the globe, elimination of rabies, brucellosis in many countries as well as control of diseases such as FMD, RP Canine distemper, would not have been possible without vaccines.

Vaccination/immunization: this is the introduction of vaccine into the body of animals to produce immunity to a specific disease.

The term vaccination comes from the Latin word *Vacca* (cow) and was coined when the first inoculations were given with organisms that cause the mild disease cow pox to produce immunity against small pox.

Vaccination also means immunization (i.e. the process of rendering a subject immune or becoming immune.)

Vaccination has proved to be far the most effective and cost effective method of controlling major infectious disease in domestic animals. Ongoing developments in vaccine design and production have resulted in great improvement in both vaccine safety and precautions.

Herd immunity: This is the resistance of an entire group of animals to a disease as a result of the presence in that group, of a proportion of immune animals. When vaccines are used in control of disease in a population rather than in an individual the concept of herd immunity should be considered. Herd immunity reduces the probability of a susceptible animal meeting an infected one so that the spread of disease is slowed or terminated.

Types of Vaccines

Vaccines are produced in several different forms for several specific types of immunity response. They may be prepared from live organisms; inactivated or killed organisms or from genetically engineered subunits of the pathogenic fraction of the organisms; or from toxoid.

1. Modified live virus vaccine: These are prepared by attenuating micro organism by growing and adapting in different media or tissues. During this process organism must lose their virulence but remain sufficiently antigenic to induce an immune response. The process of reduction of virulence is called attenuation. The most common used method of virus attenuation has been prolonged tissue culture e.g. TCRV, Live Antirabies Vaccine

The main features of live vaccines are:

- (a) The vaccine or antigenic component replicates in the host after vaccination ensuring adequate stimulation for antibody production. Immunity is usually of long duration
- (b) They are easy to handle with some exception where special requirement needs to be met.
- (c) The vaccine may produce mild disease.
- (d) There could be poor replication hence poor response.
- (e) They may produce carrier status
- (f) There may be danger of cross infection and environmental contamination.
- (g) The vaccine may produce natural antibody interference
- (h) Chemicals may inactivate the vaccine.

(2) *Killed/ inactivated vaccine* : This is prepared by killing the microorganism or by extracting the antigenic components from them which serves as antigen when injected. The organism is rendered incapable of causing the disease but still capable of inducing production of antibodies. E.g. Killed Infectious Bovine rhinotracheitis vaccine. Methods used for inactivation include the use of formaldehyde and alkylating agents such as ethylene oxide, ethyleneimine.

Killed vaccines are generally considered as less effective than the live vaccines hence they are often given in higher or multiple doses and usually contain an adjuvant (this greatly enhance the body's response to vaccines, delay the elimination of the antigen and maximizes the effectiveness of the vaccine.) e.g. aluminium salt

The main features of Killed Vaccines include:

- (a) They do not replicate in the recipient host.
- (b) The immunity is of short duration.
- (c) They can produce harmful immune reactions following natural infection.
- (d) There could be local tissue reaction due to adjuvant.

(3) *Recombinant DNA vaccines*: This is the immunization of animals by injecting it with bacterially derived DNA coding for an antigen. The DNA coding for the antigen of interest is first isolated and then inserted into a bacterium or yeast, and the recombinant antigen is expressed. If the DNA is incorporated into an appropriate plasmid, it is capable of expressing the protective antigen which is then harvested, purified and incorporated into a vaccine.

The use of modern molecular techniques can produce new and improved vaccines which are safe, cheaper and effective.

Bacterins: These are suspension of killed or inactivated disease organisms. They will not cause the disease but do initiate an immune response. An example of a Bacterin is the blackleg bacterin.

Toxoids: Inactivated toxins or poisons or disease organisms. They do not cause the disease but produce immunity to the disease. E.g. tetanus toxoid.

Antisera or antitoxins: These are products designed to produce a short-lived passive immunity. They are produced by exposing an animal to massive doses of vaccine or live disease organisms. The serum from this animal is used to produce the antisera; an example of an antitoxin or antisera is tetanus antiserum.

Administration of Vaccine

Vaccines are usually provided in standard doses irrespective of weight or size. There must be a sufficient amount of an antigen to trigger the cells of the immune system and response. This does not depend on the size of the animal.

Most vaccines are administered by injection. The simplest and the most common routes are the S/C and the I/M injections. This approach is excellent for relatively small numbers of animal and for disease in which systemic immunity is important.

Where local immunity is sometimes more important than systemic immunity, it is appropriate to administer vaccine at the site of potential invasion e.g. Intranasal vaccines are effective in protecting cattle against infectious bovine rhinotracheitis, and poultry against infectious bronchitis and Newcastle disease. Aerosolization of vaccines enables them to be inhaled by all the animals in the herd or flock. This is commonly used in poultry.

Alternatively, Vaccines can also be administered orally via drinking water and feed in poultry. Fish and shrimps may be vaccinated by immersion in a solution of antigen.

How do Vaccines Work?

Following the first vaccination, the immune system is stimulated and starts to produce antibodies against the infectious agent in the vaccine. Antibody production continues until the antigen wanes. The result of this immunologic stimulation is the production of a reserve pool of antibodies that is capable of overcoming the virulent variant of the same disease agent in the vaccine.

However, antibodies naturally decline with time and therefore it is necessary to re-stimulate (boost) the immune system with a subsequent booster dose or vaccination.

The first vaccination produces a primary immune response which usually develops slowly and is weak (low antibody levels) and of short duration. It also helps to induce immunologic memory (i.e. stimulates the memory cells) that allows the immune system to respond rapidly and efficiently on second contact with the same infectious agent. The subsequent vaccination results in a secondary immune response in which the antibody concentrations is higher stronger and persists for a longer duration.

Care and Handling of Vaccines

All animal biological products are produced under license. They must be pure, effective, and safe before permission is given to sell. It is very important to know how these vaccines should be handled after leaving the manufacturing plant till when they are administered to the animals.

- (1) All biologicals should be shipped in cool and well insulated containers. They should be stored in a refrigerator. Do not freeze your vaccines. Freezing destroys some vaccines.
- (2) Lyophilized dry vaccines should not be re-constituted until ready to be used. Do not mix more than what will be used in one hour maximum.
- (3) Always observe the expiry date printed on the bottles. Do not use expired vaccines.
- (4) Never allow vaccines to stand in the sun before or after reconstituting. Sunlight/ heat destroy or denature the vaccines.
- (5) Always use sterile needle and syringes. Never use needle and syringes that are contaminated or have been chemically disinfected. Chemicals destroy live and modified live vaccines.

- (6) Always burn or otherwise destroy vaccine bottles. Do not leave them lying around as a hazard to humans and animals.
- (7) Be as clean as possible with the inoculation procedure. Keep adequate supply of clean sterile needle and syringes and change when one gets contaminated.
- (8) Give vaccines according to manufacturer's instruction.
- (9) Get your vaccines from reliable or reputable sources.
- (10) Any adverse reactions after vaccination should be reported to the appropriate licensing authority and vaccine manufacturer.

Immunization Procedures for Large and Small Animals

Vaccination in small animals is generally less demanding. In large animals vaccination is an elaborate task, necessitating prior organization of personnel, vaccines and equipments to be used. The general procedure for cattle vaccination is as follows:

- a. Beneficiaries should be informed about time and place of vaccination
- b. Vaccines should be conveyed to the field in cold boxes or cooler with ice packs.
- c. Ensure that appropriate or sufficient diluents are carried along.
- d. Ensure that all staffs are in their protective covering.
- e. Group the animals in batches to ease vaccination. Stock should be taken of the number of animals in each group. Change needle between vaccinating every 20 animals if it's a large population.
- f. Reconstitute vaccine as prescribed. This can be done using normal saline
- g. Restrain animals and give at appropriate quantity at the specified site.
- h. Dispose the vaccines appropriately.
- i. Issue certificates. Keep a record of vaccination and other relevant records concerning the herd.

As listed above adequate preparation should be made before poultry vaccination. Water should be withdrawn overnight from birds prior oral vaccination. After vaccination it is advisable to give antistress.

Antibody titer should be usually determined at 2-4 weeks interval to determine the antibody titer. When antibody level is low, vaccinate. It is highly advisable not to vaccinate sick animals. Vaccinating sick animals seldom produce immunity and could worsen the situation.

POULTRY VACCINATION PROGRAMME

Age	Type of vaccine	Route of administration
Day 1	Marek's disease vaccine	Subcutaneous (S/C) (under the neck)
Day 1-10	Hitchner B1 (NDV)	Intra ocular (I/O) or aerosol
Day 3-5	Immucox or Livacox	Per os (P/O) via drinking water
Day 10	IBDV	P/O in drinking water
Day 18	IBDV	P/O drinking water
Day 21.	NDV Lasota	P/O drinking water
Week 5	FPV	S/C wing web
Week 6-8	NDVK	Intramuscular (I/M)
Week 16	EDSV	S/C
Week 6-16	FTV	S/C
Week 6-16	FCV	S/C
Week 16-18	NDVK (Booster)	I/M

N:B Polyvalent vaccines as oil based are now available as

- (1) Newcastle disease vaccine + Egg drop syndrome vaccine.
- (2) Newcastle disease vaccine + Infectious bronchitis + Egg drop syndrome vaccine.
- (3) Newcastle Disease vaccine + Fowl cholera vaccine.

LARGE ANIMAL VACCINATION PROGRAMME

CATTLE

Vaccine	Dose/Route of vaccination	Age	Schedule of vaccination	Duration of immunity	Source of vaccine
Anthrax Spore Vaccine	0.5ml / S/C	6months	Annual	1Year	NVRI
Black quarter Vaccine	2ml / S/C	4months	Annual	1Year	NVRI
CBPP Vaccine	0.5-1ml S/C	3months	Annual	1Year	NVRI
Hemorrhagic Septicaemia Vaccine	5ml S/C	4months	Annual	3-6 months	NVRI
Brucella Abortus Vaccine	5ml	6months	Annual		NVRI

SHEEP, GOAT AND PIGS

Vaccine	Dose/Route of vaccination	Age	Schedule of vaccination	Duration of immunity	Source of vaccine
Anthrax Spore Vaccine	0.5ml / S/C	6months	Annual	1Year	NVRI
PPR Vaccine (sheep and goat)	1ml / S/C	4months	Annual	1Year	NVRI

SMALL ANIMAL VACCINATION PROGRAMME

DOGS

Vaccine	Dose/Route of vaccination	Age	Schedule of vaccination	Duration of immunity	Source of vaccine
Antirabies Vaccine (ARV)	2.5ml / I/M	3months	Annual	3Years	NVRI
ARV (killed)	1ml / I/M	4months	Annual	3Years	Foreign
DHLPP Vaccine	1ml S/C	8, 12,16 wks	Annual	3Years	Foreign

CATS

Vaccine	Dose/Route of vaccination	Age	Schedule of vaccination	Duration of immunity	Source of vaccine
ARV/HEP	1.5ml / I/M	3months	Annual	1Year	NVRI
ARV (killed)	1ml / I/M	3months	Annual	1Year	Foreign

The NVRI i.e. National Veterinary Research Institute, VOM has been responsible for the local production of vaccines in Nigeria. However, other vaccines are imported.

Active and Passive Immunizations

These are the 2 basic methods by which animals may be made immune to infectious disease used to induce immunity against infectious disease in animals. (Acquired immunity)

Passive immunization: This produces temporary immunity by transferring antibodies from a resistant to a susceptible animal. Passive immunity requires that antibodies be produced in donor animals by active immunization and is given or inoculated in susceptible animals in order to confer immediate protection. It is usually a short lived immunity that lasts from 2 weeks to 6 months. In animals, this is usually derived from the transfer of antibodies in colostrums to the new born within the first 24 hours of birth (Natural immunity). The longevity of immunity depends on the amount of antibodies passed, the type of the antibody and what disease the protection is for. Passive immunity can also be transferred by blood transfusion or use of specific antisera or antitoxins (Artificial immunity). Antisera can be produced against a wide range of diseases. For instance they can be used to produce antisera in cattle against anthrax, in dogs against distemper, and in humans against measles.

Monoclonal antibodies are another source of passive immunity for animals. These are mainly produced by mouse hybridomas. They stimulate immune response when inoculated in animals of other species.

Active Immunization: Immunity is developed in animal that have actually had and recovered from a disease or from inoculating them with a vaccine derived from the disease organism. These vaccines produce immune response i.e. immunity without the symptoms or problems associated with the disease.

Active immunization has the following advantages compared to the passive immunity.

(1) They have prolonged period of protection. Immunity is long lived and usually last over 1 year to life time.

(2) Immunity is conferred on both the animal immunized and the foetus carried by it.

Chemoprophylaxis: The use of chemicals including drugs for disease prevention in animals e.g. antibiotics, antitrypanicides.

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