Injection technique

Subcutaneous injection is generally resorted to for most inactivated vaccines, although many vaccines are also injected intramuscularly with equal success. Whichever technique you choose, *follow the label directions carefully*, and discuss your vaccination procedures in advance with the local veterinarian/consultant as well as the Indovax representative. Also be sure to use only the recommended-size needles and monitor them frequently for "burring". Even without burrs, needles should be replaced after inoculation of every 200-300 birds.

When injecting in leg, a trained operator can handle and vaccinate birds without assistance. When injecting cage birds, it is advisable to empty one cage and fill with injected birds as one proceeds down the row. Note that these egg-type pullets already are in their laying quarters. In order to ensure at least 5-6 weeks between the last live vaccination and the inactivated vaccine injection (as is recommended with killed Newcastle / Bronchitis), many egg producers wait until the pullets are housed in the lay facility before injecting.

After inoculation in the leg with oil adjuvanted vaccines, it is not uncommon to observe some swelling in the injection site for up to 3-4 weeks post vaccination.

When speed of injection is stressed, the possibility of injecting vaccine outside the muscle increases. This is especially true when using a ¼ inch needle. When injecting through white feathers, it is even more difficult to detect this kind of vaccinating error. One further caution: a needle with too large a diameter (18 gauge or larger) may cause some of the vaccine to ooze back out of the injection hole.

Remember, an incorrect vaccine injection is a waste of time and money as well as a potential hazard to the host animal. With inactivated vaccines accuracy is far more important than speed. Killed vaccines definitely do produce superior results, but they must be administered **at the right time, at the right site and with proper injection techniques.** In the future, both antigens and adjuvants unquestionably will become more sophisticated. Researchers at Indovax are striving to identify critical antigens.

In any case, the advantages of inactivated vaccines are highly evident and represent an integral part of a well-balanced flock health protection program in every segment of the poultry industry.

INDOVAX

Committed to providing appropriate solution to poultry disease problems in tropics.

Technical Services
INDOVAX Private Limited, SCO-24, Sector-14, Gurgaon 122 001 (INDIA)
Tel : (0124) 231 5044, 231 5045, 231 5046, Fax : (0124) 231 4680 E-mail : mail@indovax.com, Website : www.indovax.com

INACTIVATED VACCINES

Why and how to use them?

Technical Bulletin **Vol. 3** **July 2006**

Theoretically, the ideal viral vaccines are the ones prepared with live avirulent strains as they would stimulate the immunizing mechanism in the same way as the natural infection, even if sometimes less intensively. Live vaccines are fit for mass vaccination but require wide and careful controls before their use on a vast scale. However, the use of inactivated or killed vaccines in the poultry industry has increased tremendously in the last few years. The theory is that by killing the organism before exposing the bird to it, you can still elicit an immune response which gets even better by incorporating high antigenic content and an adjuvant in an inactivated vaccine. The rich antigenic mass in vaccine stays at the site of inoculation for a longer time because of the adjuvant added to the vaccine. The slow release of antigen provides necessary stimulus for antibody production.

Live vaccines usually contain only antigen. An antigen is a substance which, when introduced into the body, induces the formation of antibodies. The antigen is either a virus or a bacterium. The antigen may either be a disease producing organism which has been deliberately attenuated (disease producing power weakened by suitable means, for example H 120 strain of IB) or it may be a naturally occurring mild strain of the organism such as F strain of ND virus.

Killed vaccines, on the other hand, consist of concentrated antigen combined with an oil emulsion or aluminium hydroxide adjuvant (An adjuvant is a substance which, when given with an antigen, increases the immune response of the antigen). Inactivated viral vaccines could be presented as combined vaccines or mixed vaccines since antigens against two or three different disease producing organisms can be included in a single vaccine after proper concentration of the antigen (Bivalent, trivalent, tetravalent and polyvalent). It is a well established fact that the body can respond to many antigens injected simultaneously and such response is specific for every component of the mixture.

Whilst there are both advantages and disadvantages of using inactivated vaccines for the protection of breeder flocks and commercial layers, the vast majority of the industry has found that the advantages easily prevail. Killed vaccines of some type are now included in virtually every farm's flock health program.

Major advantages of Inactivated vaccines

- There is no danger of the organism multiplying and causing an infectious reaction in a stressed, laying or immuno-suppressed bird. They are unable to replicate in the host and as such even the wild virus or pathogenic bacteria can be properly processed into a safe and potent immunogen.
- Because each bird is handled individually and given a uniform dose, the flock's immune

response is more uniform. Even with careful administration, it can be very difficult to achieve uniform exposure with a live vaccine.

- The humoral immune response (production of circulating antibody) generally is greater with inactivated vaccines. This is of particular advantage when hyper-immunizing breeder females provide passive protection to their progeny. It ensures that antibody levels against selected viruses are high enough to provide the progeny with a uniform protective immunity during the first week of life in the form of maternally derived antibodies (antibodies derived from the hen through the egg). This becomes an important asset for scheduling vaccination regimens in chicks. Also, by stimulating very high titers killed vaccines may reduce or eliminate the need for revaccination for some diseases as they have the advantage of producing long term immunity.
- Since the vaccine organism is already killed, storage requirements are less stringent and shelf life is usually longer than live vaccines.
- Several antigens can easily be mixed in one dose of vaccine as there are no infective components. Viral interference, which occurs when some live viral vaccines are given together, is not a problem with killed vaccines.
- Inactivated vaccines can be tailor made and take lesser time to develop compared to live vaccines. They can be prepared from the field isolates of a virus or a bacteria and one can respond quickly by designing a killed vaccine to cover the disease situation prevailing in a particular area.
- Inactivated vaccine can also be used as primary dose or together with a live vaccine simultaneously in exceptional situations where there is high diversity of maternal antibodies (MAb) in the chicks along with high risk of exposure to infection due to higher load of pathogens in the ambience. Theoretically, a live vaccine will be effective if it is able to establish and multiply in the body. In a given hatch of chicks with very high maternal antibody levels, the live vaccine will remain ineffective. It is difficult to postulate as to the time when all the chicks will lose their MAb umbrella. In such a situation if killed and live vaccines are given simultaneously:

- Live vaccine will establish immune response in chicks with low Mab

- Killed vaccine impetus will remain in the system till such time the system is able to accept the antigenic stimulus.

It is, therefore, necessary that the use of inactivated vaccine is based on proper analysis of the population.

Are there any limitations?

- Inactivated vaccines are more expensive. The dead organisms do not multiply within the host animal so many more organisms must be included in each dose for presentation to the immune system. The addition of adjuvants also increases the cost to produce these vaccines.
- Labour cost to administer such products is considerably higher, since mass vaccination (drinking water) is not yet possible. Each bird must be individually handled and injected.

Taking all the pro's and con's into account, the poultry industry-almost without exception-now considers inactivated vaccines as 'state of the art' for production of superior antibody titers and protection from challenge in breeder flocks and commercial layers.

It is important that the inactivated vaccines carry sufficient antigen for their efficacy. Zanella and Marchi (1981) suggested average titres of different antigens used to prepare inactivated vaccine oil emulsion as underlined in the table below.

Suggested quantitative antigen content in vaccines

Sr. No.	Disease/ Organism	Quantity of virus (log 10)	Method of titration
1.	Newcastle disease	8-8.5	EID_{50}
2.	EDS	8-8.5	EID_{50}
3.	IBV	6.5-7	EID_{50}
4.	AE vaccine	5-5.5.	CPD_{50} (chick paralyzing dose)
5.	IBD	6-6.5	$TCID_{50}$
6.	Hemophillus	8-9	CFU

As with all vaccination procedures there are do's and don'ts to be followed for best results. Most killed vaccines require particularly close attention in these areas: **Priming, Timing** and **Injection technique**. Oil emuslion killed vaccines, when used after priming (first vaccinating) with a live virus vaccine, provide long lasting high levels of immunity. This should be considered as an alternative to repeated live virus vaccinations during the laying cycle. It, therefore, makes killed vaccines more practical for use in layer and breeder flocks in which long term protection against disease and/or egg production drop is called for. Vaccination schedules should be planned well in advance so that priming (if necessary) and injection are done at the right time, to provide the best protection. Your Veterinarian / Consultant and Indovax Representative can be helpful in this regard.

Using proper injection technique is mandatory with all inactivated vaccines. Missed birds or improperly injected ones become susceptible birds. Bird damage can be a risk which must be guarded against.

The cost of killed vaccines compared with the initial outlay for live products and the labour cost for individual bird inoculation demands that extra attention be paid to their administration. Following are some handling and injection recommendations which can help to improve the return on your vaccine investment.

Preparation for injection

Killed vaccines should be stored in the dark, in a refrigerator at temperature ranges of 2-8°C (35-46°F). The vaccine should be brought to room temperature before injecting. This improves the syring ability (makes the emulsion less viscous), and reduces irritation to the bird. Immediately prior to use, *shake the vaccine vigorously* for 30-60 seconds.

There are several types of vaccinators which can be used for the actual vaccine delivery. Whichever is chosen, it is best to invert (hold the bottle upside down) the vaccine bottle rather than drawing vaccine from the bottom of an upright bottle. The latter method usually leaves several doses irretrievable at the bottom of the bottle, an unnecessary waste of product and money.

Many good syringes are available for injection of inactivated vaccines. The type you choose should be comfortable, durable and accurate. Replacement parts should be readily available. A short needle is recommended - ¼ to ? inch by 20 gauge. This length allows proper intramuscular injection.

Self-injection can best be avoided if operators are properly trained, care exercised and speed of vaccination controlled. The viral or bacterial portion of the vaccine can not be transmitted to humans, since it is inactivated or killed, but bacterial contamination from used needles and other external contact is possible.