RECENT ADVANCES IN THE DIAGNOSIS AND CONTROL OF MAJOR DISEASES OF LIVESTOCK IN NIGERIA

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ABSTRACT

For quicker and specific laboratory diagnosis there is a trend towards processing of specimens by sophisticated procedures like electron microscopy, immuno-electro-Osmo-phoresis, Fluorescent antibody and enzyme linked-immunosorbent tests. Specimens must, therefore, be collected as early as possible and transported on ice, without which the chances for diagnosis will be much reduced. Evolving disease resistant animals and birds has not met with success. The best means of preventing disease are by following strict measures of hygiene, sanitation, quarantine and segregation, including compulsory slaughter of the infected and the 'incontact animals'. When this is not possible, such as, for enzootic diseases and for those affecting many species of animals, vaccination is the only alternative. The quality of the vaccine and the manner in which it is administered will ultimately decide the outcome of immune response. Use of cell culture technology and genetic engineering have paved the way for modern technology of vaccine production. It is hoped that, in future, vaccines will be available to control diseases against which there are none at present.

INTRODUCTION

The Institute has been actively engaged in the diagnosis and prevention of contagious diseases for the past several decades and is the pioneer Institute in this field in Nigeria. Economic evaluation of epidemiological data has shown that, among many diseases that plague the livestock and poultry industry in Nigeria, the significant ones include the following:

- i. Rinderpest, contagious bovine pleuropneumonia (CBPP), dermatophilosis, trypanosomiasis, babesiosis, anaplasmosis and foot and mouth disease (FMD) of cattle.

- ii. Rabies of dogs and cats,
- iii. Peste des petits ruminants (PPR) and pox diseases of sheep and goats, and
- iv. Newcastle disease, Gumboro disease, salmonellosis mycoplasmosis and egg drop syndrome of poultry.

For diagnosis of most of the these diseases there are serologic tests and for control there are vaccines. On an average the Institute processes over 5,000 specimens for diagnosis and manufactures 80-90 million doses of vaccines annually for prevention of contagious diseases of animals. The diagnostic reagents for CBPP, rinderpest, brucellosis, Newcastle disease, PPR and salmonellosis of poultry are produced locally while reagents for other diseases are imported from overseas. In the recent past the Institute has developed vaccines against Newcastle disease (Lasota strain), rabies in cats and Gumboro disease in poultry, while cell culture rabies vaccine for dogs is in its final stages of testing. Although the Institute is trying to modernise its laboratories by equipping them with the latest available instruments and appliances, such as an electron microscope and industrial freezedryers, there still remains a gap between present facilities and those available to similar Institutes in the developed world.

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ADVANCES IN DISEASE RESEARCH

Rinderpest

A quick laboratory diagnosis can be given with fresh, infected lymphoid tissues by the immuno-electro-osmophoresis (IEOP) test which is 8-16 times more sensitive than the agar gel precipitation test (AGPT). Moreover, results can be obtained within a couple of hours (Majiyagbe *et al*, 1981). Most of the recent outbreaks in Sokoto, Kaduna and Niger states were diagnosed by IEOP test although virus isolation and identification is in progress. As compared to other tests like enzyme — linked — immunosorbent — antibody (ELISA) test, complement fixation test, or neutralisation tests IEOP test is much simpler, quicker and requires fewer reagents.

Tissue culture rinderpest vaccine is the ideal vaccine for rinderpest control and a dose given to calves, when they have shed maternal antibody, produces lifelong immunity. Partial immunity may be produced in the field if non-viable is administered. It is, therefore, very important that a cold chain is maintained during storage and transportation of the vaccine and that the specific diluent is used. Reconstituted vaccine should be used within an hour or the balance should be discarded.

A word of caution has been given by the Institute on the falling level of immunity to rinderpest (Nawathe, 1978; Taylor and Ojeh, 1981). As the disease is prevalent in neighbouring countries, its introduction will be a constant threat. Since over 70% of the cattle population is immune, pandemics will not occur but sporadic outbreaks are likely.

The Organisation of African Unity's Scientific, Technical and Research Commission and the Inter African Bureau of Animal Resources (OAU/STRC/IBAR), in association with Foreign Aid Organisations, are embarking on a Joint Project

aimed at the eradication of rinderpest and CBPP from Africa once and for all.

Contagious Bovine Pleuropneumonia (CBPP)

CBPP needs efficient diagnostic tests, not specifically to diagnose the disease, but principally to detect the chronic carriers or "lungers". The agar gel precipitation test is efficient in diagnosing field outbreaks but for the identification of "lungers" the Complement Fixation Test (CFT) is currently employed. More recently the ELISA test was developed (Onoviran and Taylor-Robinson, 1979) and a field evaluation is going on with another test, the passive haemagglutination (PHA) test (Chima and Onoviran, 1981). CFT antibodies persist for 2 months while PHA antibodies persist for 9 months. In future PHA test will be a routine procedure because it is more sensitive than CFT.

Earlier, KH₃J broth vaccine, though completely innocuous to all breeds of cattle, was noticed to give immunity of short duration. It was replaced by a little stronger "T₁ strain and its keeping quality was further improved by lyophilisation (Onoviran, Adegboye, Makinde and Chima, 1978). There have been some reports of a break-down of immunity with "T₁ vaccine. On investigation it was found that the vaccine was applied after the date of expiry. On average, 10 million doses of vaccines are currently issued annually for the Joint Project 28 Anti — CBPP campaign (J.P. 28 campaign). Like Joint Project 15 Anti-rinderpest campaign, the JP 28 campaign against CBPP also needs the cooperation of all the countries where the disease exists today. The efforts of OAU/STRC/IBAR in this direction are commendable.

Dermatophilosis (Klrc)

The disease not only affects cattle but also other species of animals, such as,

sheep, goats, horses etc. Its eradication, so far, appears all but impossible. There is no vaccine to prevent it and the treatment, whether topical or systemic, with antiseptics and antibiotics, is useful only in the initial stages (Gbodi and Ndife, 1981). Similarly, insect wounds predispose an animal to *Dermatophilus* infection, and the prevention of such wounds by regular spraying and dipping with insecticides has some effect on the incidence of the disease. Such procedures, however, do not afford complete protection. Careful management, such as the immediate isolation of a sick animal and its prompt treatment to prevent further spread of the disease, can only help in keeping the disease under control.

Trypanosomiasis

It is possible to grow the parasite in cell cultures and attenuate it to produce a vaccine but, unfortunately, it is only useful against that specific type. The trypanosome has many species and a variety of antigenic types occur in each species due to a quick antigenic shift in the parasite. It is, therefore, impossible to contemplate such a vaccine at present.

Elimination of the vector (tsetse fly) can be done by aerial insecticide spraying; bush clearing to destroy the breeding places, or by employing the sterile male technique. At present "Bicot" is busy raising colonies of tsetse flies and since April 1981 irradiated males are being released in the field. The degree of success of this project will determine the methods of vector control to be employed in future where the fly population is less dense.

Chemoprophylaxis against trypanosomiasis is rather expensive and requires frequent visits by a veterinarian. Indiscriminate use of drugs results in drug-resistant trypanosomes, thereby calling for repeated research into newer drugs.

Anaplasmosis and Babesiosis (Piroplasmosis)

For these tick-borne diseases the control of ticks is very important and this can be achieved by the use of insecticidal sprays or dips for animals and the destruction of tick hiding places by burning or by the use of a blow lamp. The use of one insecticide results in the development of resistant ticks, a condition which can be avoided if different insecticides are used in rotation. The frequency of treatment has to be increased during the wet season and the insecticide solution should be monitored for its acaricidal potency from time to time.

For highly susceptible exotic dairy cattle, vaccines are available for pre-immunization. The procedure consists of inoculating infected blood; this is then followed by chemotherapy to prevent clinical reaction (Ilemobade, 1977). Usually during the wet season, when an animal is noticed to be suffering from piroplasmosis, prophylactic treatment with tetracyclines and babesidocides (babesan, bernil or imidocarb) is given to the whole group of animals to prevent losses occurring.

Foot and Mouth Disease (FMD)

Diagnosis of FMD is obvious from the clinical signs and epidemiology. Laboratory confirmation can only be obtained by identification of live viral antigen (infected tongue epithelium) by a complement fixation test (CFT) using specific sera raised in guinea pigs. Fluorescent antibody test (FAT) or ELISA test are yet to be applied on a routine basis. For virus isolation, bovine thyroid cell culture, pig kidney cell line or BHK-21 cell line is employed. Virus grows rapidly within 12-24 hours and again CFT is employed to identify and type it.

In Nigeria, for the past 2 decades FMD outbreaks have been due to type A, SAT₁ and SAT₂ (Nawathe and Goni, 1976). Furthermore, there were antigenic dif-

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ferences within the type when it occurred in another wave of epizootics a few months later. Due to antigenic differences, FMD vaccines will always require the incorporation of newer strains. Commercial vaccines are, therefore, ineffective (Nawathe and Majiyagbe, 1981) unless they are prepared from local (Nigeria) strains (Mowat et al, 1975). A trial with such a vaccine, prepared by the Wellcome Company, is under way and results are awaited.

A break-through in the production of FMD vaccine by genetic engineering is a significant step in the field of vaccine production technology. The immunogenic principle in the virus is isolated and then it is spliced on to Bacterium coil. Then the organism is grown in culture media and a vaccine is prepared by inactivation and addition of adjuvants. By this technique it is possible to produce the vaccine within a period of 6 weeks. It is hoped that this technique will be made use of in the production of vaccines against diseases for which there are none at present.

Rabies

Because of its public health significance rabies is a very important disease in developing countries. Invariably a dog or a cat is the vector. For rapid diagnosis, the fluorescent antibody test (FAT) has replaced the earlier tests for "Negri body" or the mouse inoculation test. Even during life FAT can be applied to corneal impression smear, skin with a hair follicle or brain biopsy material.

For prevention, there is a trend towards the use of inactivated cell culture vaccines both in man and animals. However, for rabies campaigns, the use of live vaccines initially has been recommended by the World Health Organisation. Immunisation with inactivated vaccines is preferred when rabies has been brought under control (WHO, 1980). The Institute has accordingly developed a cell culture rabies vaccine for dogs which is in the final stages of testing.

Peste des petits ruminants (PPR)

Diagnosis and prevention of PPR in sheep and goats is done in the same way as for rinderpest in cattle. Both these viruses can be differentiated by cross neutralisation tests in cell cultures or by the ELISA test. Other tests, like, AGPT, IEOP, CFT etc. are considered group specific.

TCRV is vaccine of choice at the present time (Anon, 1978; Taylor, 1979; Nawathe, 1979). The safety of the vaccine has been proved even in pregnant goats (Adu & Nawathe, 1981). In Oyo State, Obi (1981) vaccinated several hundred goats, under an ILCA programme, without any side reactions whatsoever. Nduaka and Ihemelandu (1978) suggested a sero-vaccination method for "boughtin" goats which may be employed by entrepreneurs, but, for control and eradication of PPR, mass vaccination with TCRV is the solution.

Pox diseases of sheep and goats

In the recent past sheep and goat pox outbreaks have been reported from Sokoto, Kano, Kaduna and Oyo States. For rapid diagnosis, AGPT works as well as the IEOP test, except that it requires overnight incubation. Transmission experiments and cross-neutralisation tests in cell cultures have shown that these viruses markedly differ from those prevalent in East Africa. In Nigeria sheep pox and goat pox viruses are host specific while in East Africa they are not (Asagba et al, 1982).

Attenuation of sheep pox virus (Asagba and Nawathe, 1981) by passage in cell culture is being carried out at present at Vom.

Newcastle disease (ND)

The ND virus strains prevalent in Nigeria are velogenic type (Nawathe et al, 1975). Moreover, apparently normal ducks (Majiyagbe and Nawathe, 1981) and parrots (Onukwo and Momoh, 1980) also spread the virus. Commercial poultry

flocks, therefore, must be protected solidly against the clinical disease, mortality and loss of egg production. The disease can affect birds at any age and therefore a need to protect them as early as possible. Midler vaccines (intra-ocular, Lasota) are sensitive to pre-existing antibody, therefore there is need to repeat them 2—3 weeks later to be followed by a dose of a stronger vaccine (Komarov strain).

A couple of years ago Britain stopped the manufacture and use of ND vaccine because the disease there has been eradicated. Slaughter and compensation policy has been adopted in the event of any introduction of the disease in that country. Eradication of the disease was possible because all the poultry in Britain is kept under intensive system of management. Since free roaming chickens and feral birds maintain the virulent virus in circulation in Nigeria, eradication cannot be thought of. Control of the disease too is difficult since about 90% of the poultry is under an extensive system of management.

Gumboro disease

The problem of Gumboro disease has arisen in Nigeria during the past few years because of the indiscriminate importation of chicks (Onunkwo, 1975). Laboratory diagnosis of the disease is done by AGPT with the antigen derived from the infected bursa of Fabricius. The disease is ubiquitous and the virus is heat resistant, with the result that prevention is very difficult. Once the disease occurs on the farm, it becomes a persistent infection. Like Newcastle disease, Gumboro disease also requires repeated vaccination. If by any means chicks can be protected against the disease for the first 4 weeks of life, the economic returns will be satisfactory. In developed countries, Gumboro vaccine is given to breeder hens only. Currently an oil-based commercial vaccine for breeder hens is being tested at Vom for its safety

and potency. If found satisfactory, attempts will be made to manufacture it in commercial quantity.

Salmonellosis and Mycoplasmosis

These bacterial diseases cause heavy losses in poultry despite the liberal use of drugs and antibiotics to suppress them. Diagnosis of these diseases is very simple and is done by whole blood or serum plate agglutination test. There is a vaccine against fowl-typhoid (*S.gallinarum*) but there is none against other salmonellae or Mycoplasma. Under present circumstances a high level of hygiene and sanitation are the primary means of their prevention.

Egg drop syndrome '76 (EDS '76)

Substantial serological evidence of EDS '76 adenovirus has been found in Nigeria. Like Gumboro disease, this disease also made its way into the country through importation of chickens. Serological diagnosis is done by haemagglutination inhibition test since the virus has the property to agglutinate chicken red cells (Nawathe and Abegunde, 1980).

The vaccine for EDS '76 is available commercially; this should be given to pullets well before they come in to lay. Drop in the egg production and horizontal spread of the virus occurs soon after the birds come into lay. However, it must be borne in mind that there are other diseases and conditions capable of causing a drop in egg production, such as, Newcastle disease, infectious bronchitis, avian encephalitis, malnutrition, sudden change in weather conditions etc.

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