Gumboro disease: Problems of control in Nigeria

D.R. Nawathe and A.G. Lamorde*

Summary: The control of Gumboro disease in Nigeria presents a complex problem because of its becoming highly endemic and ubiquitous. Usual methods of sanitation and hygiene are of no avail due to the resistant nature of the virus, hence the only effective means left is control by vaccination. Since a virulent vaccines do not elicit a satisfactory immune response in the presence of maternal antibody it is imperative to repeat such vaccines frequently or to develop and use stronger but non-immunosuppressive live as well as inactivated oil-emulsion vaccines for booster purposes. If chicks could be protected successfully for the first few weeks of life at least the economic returns will be guaranteed.

INTRODUCTION

Gumboro disease of chickens was first observed by Cosgrove in 1962 in Gumboro county, Delaware, U.S.A. hence the name « Gumboro disease ». Other names of the disease entity based on the lesions produced included avian nephrosis-nephritis, avian infectious bursitis and infectious bursal disease, etc. The disease has been recognised in Nigeria since 1969 (Ojo et al., 1973) and further incidence described by Onunkwo (1975) and Nawathe et al. (1978). Even today the disease persists in virulent form causing 5-30% mortality in chicks of 3-6 weeks of age. Very often cases of vaccination failures have been detected primarily due to improper storage, transportation and administration of vaccine and secondarily due to interference of active immunisation by the maternal antibody. The resistant nature of the virus of Gumboro disease to temperature, pH and common phenolic disinfectants further complicates its control by sanitation and hygiene. The main course left to control the disease is by way of vaccination with a suitable vaccine and at a proper age. At present only highly attenuated apathogenic vaccines are imported from overseas or produced locally which are ineffective in the presence of maternal antibody. There is a need to develop oil-based inactivated vaccines and vaccines from stronger but non-immunosuppressive strains to suit requirements of each category of poultry stock.

* National Veterinary Research Institute, Vom, Nigeria.
THE SITUATION IN NIGERIA

Nigerian poultry consists of 10 million (m.) exotic chickens kept on commercial farms and free-roaming 124 m. local chickens, 45 m. guinea fowls, one million each of turkeys and ducks. Disease control programmes are easier to apply to those on organised farms but are very difficult for those whose movements are unrestricted. It is these chickens that maintain the virulent viruses and bacteria in circulation challenging continuously those on the commercial poultry farms.

Gumboro disease epizootics occur in the poultry rich southern states of Nigeria with 90-140 outbreaks involving 0.5 m. chicks annually. The disease causes chick mortality up to 30% in addition to poor feed conversion and immunosuppression against vaccination with Newcastle disease, fowl pox and fowl typhoid. Many a times vaccination with mesogenic Komarov strain of Newcastle disease is known to cause serious recrudescence because of failure of primary vaccination undertaken at a day-old age with a lentogenic vaccine in presence of maternal antibody or because of intercurrent infection with Gumboro disease, coccidiosis, salmonellosis or mycoplasmosis. Clinical picture and post mortem lesions of Gumboro disease overlap with those of Newcastle disease with the result that many outbreaks are misinterpreted or not reported at all for want of confirmatory laboratory diagnosis. The clinical disease is known to occur as early as 9 days (Onunkwo, 1975) to 20 weeks of age (Okoye and Uzoukwu, 1981). At the Institute's farm infection occurs at about 2 weeks of age in chicks when maternal immunity has waned off. Precipitating antibodies have been detected in chicks between 4-5 weeks of age (Nawathe, 1979). Serological evidence suggests that even free-flying feral birds contribute to the spread of disease (Nawathe et al., 1978). Most farms are multiage and all-in and all-out system of management is not followed hence infection persists for ever. Once Gumboro disease occurs, the farms remain permanently « Gumboro farms » (Nawathe et al., 1981). On new farms hygienic measures may help to keep off the disease but liberal use of disinfectants and sanitisers is not possible due to exorbitant prices. Poultry drugs and medicines are not manufactured in the country and since these are imported they naturally become expensive.

Manifestation of the clinical disease is dependent upon the susceptibility of chicks, presence of maternal antibody and the virulence of the strain involved. In Europe and U.S.A. subclinical disease is a rule while in the developing countries clinical disease persists largely due to inadequacy of control measures. The situation of Gumboro disease in Nigeria is very similar to the one in Ghana (Gyening and Awumbila, 1977) or in other West African countries (Sagna, 1977).

The disease has become enzootic throughout the country, therefore, the only choice left for its control is by vaccination of chicks as early as possible. A vaccine trial was conducted with an imported vaccine from Germany (TAD Pharmaeuticals) in 25 seven-day-old chicks using a challenge strain isolated
locally by Onunkwo (1975). The vaccinated birds withstood challenge while 12 out of 20 controls died in 3-12 days post-challenge. The vaccine also had an egg infective dose titre of $10^{5.5}$ per 1,000 doses (Nawathe, 1976). Since then vaccines prepared from highly attenuated and apathogenic strains (Thornton and Pattison, 1975) have been either imported or manufactured to a limited extent locally. Since the disease is enzootic, most of the chicks hatched have a variable degree of maternal antibodies and therefore vaccination with apathogenic strains is partially successful. For this purpose it is advised to repeat vaccination after a period of 2-3 weeks. Such types of vaccines being sensitive in the presence of pre-existing antibody is the basic reason of vaccine failures or vaccine breaks. So far inactivated oil-adjuvant vaccines or live vaccines prepared from strains of low pathogenicity effective in the presence of pre-existing antibody, have not been introduced in Nigeria. Gum­boro disease is of economic significance in Nigeria in view of the chick mor­tality and immunosuppression. It is time that one takes a look at the vaccines to be developed to meet the deteriorating field situation. Fortunately so far no other serotype involving turkeys and ducks has been noticed in Nigeria.

**DISCUSSION**

1. **Preventive management.**

The ubiquitous nature of the disease indicates that it spreads readily and persists for a long time. Quarantine, hygiene and sanitation do limit the spread of the disease but due to the resistant nature of the virus getting rid of the infection completely is very difficult especially if sites are multiage. « All-in and all-out » system of management and liberal use of disinfectants containing iodine compounds or formaldehyde may help to reduce the incidence. Affected birds refuse to drink water therefore forcing them to do so aids recovery. Addition of milk, molasses and antistress medication to drinking water could be tried.

2. **Vaccines.**

The early methods included deliberate exposure by housing in the com­pany of infected chicks or by dispersal of infected bursal suspension or by embryo propagated virus. Though it worked in the field in cutting down the chick mortality, it contributed towards persistence of infection on the farm requiring a similar treatment for every batch of chicks hatched (Edgar and Cho, 1973).

First attenuated vaccines were developed by passing the virus serially in embryonated eggs for about 60 times. Some of these had still retained viru­lence for the bursa of Fabricius and subsequent immunosuppression in chicks without maternal antibody. When administered to chicks after 7 days no bursal lesions were found. In the field such vaccine achieved popularity by reduc­ing mortality in the endemic areas (Thornton, 1977).
Further passages of the vaccine virus in eggs and cell cultures yielded avirulent or mild vaccines. These were effective only in chicks without maternal antibody (Wood et al., 1981; Cursiefen et al., 1979; Vielitz and Landgarf, 1975). Since the disease has spread all over the country, chicks would certainly have some maternal antibody which would be responsible for preventing successful vaccination. The maternal antibody in the progeny lasts for about 17 days where breeders were vaccinated with live vaccines (Wyeth and Cullen, 1979).

Inactivated vaccines do not produce immunity (Winterfield and Hitchner, 1964) unless adjuvants are added. Oil-emulsion vaccines prepared with infected bursae, embryonic or cell culture fluids and used as booster by intramuscular route result into solid immunity for the rest of the life and the progeny is immune for the first 3-4 weeks of life as well (Wyeth and Cullen, 1976). It takes 5 weeks after the vaccination for the progeny to have maternal antibodies. Preparation of oil-emulsion vaccine requires special technology which was developed first in Europe and later in the U.S.A. Since protection of chicks in early life against Gumboro disease, Newcastle disease, infectious bronchitis is important as well as protection of layers against egg drop syndrome (EDS) 1976, a multivalent oil-emulsion vaccine against these diseases given around 14-18 weeks of age to breeders would serve the ideal purpose. Such vaccines are now available commercially (Anon., 1981).

3. Vaccination practices.

Since chicks are most susceptible to many infectious diseases mass vaccination is resorted to as soon as they leave the hatchery. Newcastle disease, Gumboro disease, Marek's disease and infectious bronchitis are at least to be taken care of at that age. Chicks in first few days of life are not immunocompetent to respond to all these vaccines unless they are 4 weeks old. Mass vaccination does not always result into mass protection. Individual variation, presence of maternal antibody and peck order of the chicks play an important role in the ultimate immunological response.

The oil-emulsion (inactivated) Gumboro vaccine produces a high level of immunity in adults when given as a booster by the intramuscular route (Wyeth and Cullen, 1976). Immunised breeders pass on the immunity to the progeny which is very valuable since the effect of Gumboro virus is age-related. Bursal damage afterwards is minor and despite this, economic returns are rewarding. There seems to be no need to vaccinate broilers whose life is 42 days (MacFerran, 1981).

Although Thornton and Pattison (1975) have shown that protection against Gumboro disease is not related to virulence of the vaccine virus, a virulent vaccines have failed to elicit immune response in chicks with maternal antibody (Lucio and Hitchner, 1980; Winterfield et al., 1980, Woods et al., 1981). Stronger vaccines administered after 7-10 days faired well in such situations and did not require repetition (Anon., 1981).

Résumé : La prophylaxie de la maladie de Gumboro pose un problème complexe au Nigeria, où cette maladie devient fortement endémique et ubiquitaire. Les méthodes habituelles d'assainissement et d'hygiène sont sans effet, en raison de la résistance du virus; la vaccination reste donc la seule méthode de lutte efficace. Comme un vaccin à virulente n'induit pas une réponse immunitaire satisfaisante en présence d'anticorps maternels, il est impératif de répéter fréquemment les vaccinations, ou bien de mettre au point et d'utiliser pour les immunisations de rappel des vaccins vivants plus puissants mais dépourvus d'effet immunosuppresseur, ainsi que des vaccins inactivés en émulsion huileuse. Si l'on réussissait à protéger les poulets pendant leurs premières semaines de vie, au moins la rentabilité économique serait assurée.

* * *


Resumen : En Nigeria presenta un problema complejo el control de la enfermedad de Gumboro, por estar llegando a ser esta enfermedad altamente endémica y ubiquitaria. Effectiveamente, no valen los métodos habituales de saneamiento e higiene, debido a la resistencia del virus; así, pues, la vacunación es el único método de lucha eficiente. Como una vacuna a virulenta no induce una respuesta inmunitaria satisfactoria en presencia de anticuerpos maternos, resulta imprescindible repetir a menudo las vacunaciones, o bien elaborar y utilizar para las inmunizaciones de revacunación, vacunas vivas más potentes, pero desprovistas de efecto inmunosupresor, así como vacunas inactivadas en emulsión oleosa. De lograrse proteger a los pollos en las primeras semanas de vida, por lo menos quedaría asegurada la rentabilidad económica.

* * *

REFERENCES


2. CURSIEFEN D., VIELITZ E., LANDGARF H. and BECHT H. — Avian Path., 8, 341-351.


