Small-scale Family Poultry Production

Egg-Drop Syndrome ’76 in different bird species in Nigeria – a review of the epidemiology, economic losses, challenges and prospect for management and control

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Egg Drop Syndrome 1976 (EDS-76) is a viral disease of laying birds characterized by a sudden drop in egg production, failure to achieve peak production and the laying of poor quality eggs. It has been reported to affect a wide range of birds including turkeys and layers and is a major constraint to the profitability of egg production in both commercial and village laying birds. This paper is a review of the epidemiology of EDS-76 virus infection in various species of poultry in Nigeria, with emphasis on the susceptibility of species, types and ages. Also examined are the economic impacts, challenges and prospects of EDS-76 virus management and control. This review will be of assistance in the formulation of an effective strategy for proper management and control of the disease in the field.

Keywords: EDS-76 Virus; epidemiology; economic impact; challenges; prospects; control; poultry

Introduction

The total poultry population in Nigeria has been estimated at about 150 million (RIM, 1992). Out of these, about 8.0% are exotic breeds and over 90% are rural poultry of different species (Nwanta et al., 2006). David-West (1979) reported that about 90% of
internal supply of poultry meat and 72.9% of that of eggs in Nigeria were contributed by various rural poultry species compared to the 27.9% supply of exotic or commercial poultry.

The first report of EDS-76 in Nigeria was made in 1980 (Nawathe and Abegunde, 1980) and since then the disease has been recognized as a potential threat to layer and breeder flocks (Durojaiye and Adene, 1988; Durojaiye et al., 1991; El-Yuguda et al., 2005). Serological evidence of EDS-76 has been reported in various poultry species including chickens, ducks, guinea fowls, turkeys, geese and quails in Nigeria (Durojaiye et al., 1991; El-Yuguda et al., 2005; Ezelibe et al., 2008; Ezema et al., 2008).

The economic losses due to EDS-76 virus infection in the Nigerian poultry industry and elsewhere have been shown to be enormous. Nawathe and Abegunde (1980) estimated an annual loss of about 20,000 tonnes of eggs in Nigeria due to the disease, while McFerran et al. (1977), in their earlier studies on depressed egg production syndrome in the Northern Ireland, reported 30% annual egg loss. Poultry farmers and rural poultry owners in Nigeria complain of poor egg production and egg quality in their laying birds. Most of the poultry keepers are ignorant of the existence of EDS-76 virus infection. The vaccine against the disease is not popular. Egg EDS-76 occurs in Europe, Asia, Africa and Latin America but has not been reported in the U.S. or Canada (McFerran et al., 1977). Respiratory disease in goslings has been reported only from Hungary.

In Nigeria, emphasis has been on the control of viral diseases like Newcastle disease (ND), Infectious bursal disease (IBD) and Avian Influenza without any attention being given to the prevention and control of EDS-76 virus infection. This may probably be due to the fact that the affected birds are apparently healthy (Ezema et al., 2008).

In this review paper, the epidemiology, economic losses of the disease as well as the challenges and prospects for its management and control are discussed.

Epidemiology and pattern of EDS – 76 virus distribution in Nigeria

Egg drop syndrome (EDS) affecting the flocks of laying fowl is widely distributed and outbreaks recorded in many countries of the world including Nigeria (Nawathe and Abegunde, 1980). The aetiological agent of Egg drop syndrome (Atadenovirus) has been isolated from the chickens during the 1980s and 1990s worldwide (McFerran and Adair, 2003). Respiratory disease in goslings has been reported only from Hungary (Ivanics et al., 2001). The EDS virus (EDSV) was described for the first time in 1976 and has been reported to be vertically transmitted through eggs (Van Eck et al., 1976). The EDSV or the antibodies against the virus have been detected not only in hens but also in wild birds (Malkinson and Weisman, 1980), wild water fowl (Schlor, 1980; Gulka et al., 1984) and pigeons (Durojaiye et al., 1991). In spite of the fact that the disease outbreaks were recorded only in laying hens, it has been demonstrated that ducks and geese were natural EDVS hosts (Schlor, 1980; Zsack et al., 1982; Bartha and Meszaros, 1984; Brugh et al., 1984). The receptivity to the infection and its transmission by contact has been observed in pheasants, guinea fowls and quails (Zanella et al., 1980). The EDS outbreaks observed in the quail flocks, when housed with infected chickens, resulted in a fall in egg production, an increase of the number of the soft-shelled eggs, as well as the development of antibodies to the virus (Das and Pradhan, 1992). The involvement of the EDSV in a severe respiratory disease in young goslings was also reported (Ivanics et al., 2001). Occurrence of antibodies has also been reported in non-poultry avian species such as gulls (Bartha et al., 1982), owls, storks, swans (Kalita et al., 1980), sparrows and cattle egrets (Malkinson and Weisman,
Experimental infection investigations confirmed that turkeys can be infected by a direct contact, the eye–drop and the combined intra-nasal and oral routes (Parsons et al., 1980; Zanella et al., 1980; Kaleta et al., 2003), without any clinical signs of the infection. However a naturally occurring egg drop syndrome infection in turkeys has been reported in Croatia (Bidin et al., 2007). These species of birds play a crucial role in the epidemiology of EDS–76 viruses.

EDSV has been detected in cloacal swabs between 3 and 10 days post-infection (Bidin et al., 2007). A rapid humoral response is generated one week post-infection and detectable antibody titres were found 28 weeks later (Bidin et al., 2007). Earliest studies revealed that EDS-76 virus is a vertically transmitted infection with poor horizontal spread especially in caged flocks (Van Eck et al., 1976; McFerran et al., 1977; Cook and Darbyshire, 1980). These studies further showed that, following infection in vivo, there was no excretion until onset of lay, when the unmasking of the virus resulted in virus excretion and rapid spread. Horizontal transmission is thought to be mainly by the oral route; Rhode Island Red hens were shown to produce abnormal eggs from 10–24 days post inoculation. Birds infected vertically can remain asymptomatic until they begin laying eggs.

EDS-76 virus can be found on fomites including water. Some outbreaks have been attributed to contact with wild birds or water contaminated by faeces from wild birds. Horizontal transmission has been reported to be possible by needles. Transmission via insects is also possible (OIE report, 2006).

In Nigeria, Nawathe and Abegunde (1980) reported a relatively high incidence of antibodies of EDS-76 virus in commercial farms in the Northern States of Nigeria. Durojaiye et al. (1991) also reported EDS-76 virus in poultry and other avian species in farms and markets in the Northern and Western States of Nigeria. Records of antibody titres of 16–256 in 90% of farms with history of lowered egg production in Nsukka, Enugu State of Nigeria by Ezeibe et al., (2008), suggests serological evidence of EDS-76 virus infection in Eastern States of Nigeria. A study conducted on locals chicken at Nsukka zone of Enugu State of Nigeria, also revealed a prevalence of 32.98%.

**Economic losses of EDS-76 in Nigeria**

EDS-76 virus infection has been a threat to the poultry and other avian species all over the world. In Nigeria, it has threatened the existence, survival and profitability of the poultry industry, because at present there is no government policy to protect poultry farms and rural poultry against the disease (Nawathe and Abegunde, 1980). Affected laying hens have been reported to lay eggs that show loss of colour in pigmented eggs, thin-shelled, soft-shelled and shell-less eggs (McFerran et al., 1978) quoted by Ezeala (2007). The shells of the eggs produced may be rough or ‘chalky’ and may not attract good price. The shell-less eggs, in some cases, may not always be found as they are frequently consumed by the birds. Egg production usually drops up to 40% and such birds, in most cases, never achieve peak production (McFerran et al., 1978; Baba et al., 1998).

Nawathe and Abegunde (1980) gave an estimate of annual loss of about 20,000 tonnes of eggs in Nigeria due to EDS-76 virus infection. McFerran et al. (1978), in early studies on depressed egg production syndrome in the Northern Ireland, reported 30% annual egg loss. In exposed flocks, failure to achieve predicted egg production target results in huge losses of financial investment. Experimental Egg Drop Syndrome Infection studies conducted by Adene et al. (1995) at pre- and early-laying stages in domestic fowls showed delayed egg production, significantly lowered egg production and the
appearance of malformed eggs in infected groups compared to uninfected flocks. Unvaccinated flocks expressing anti-bodies to EDS-76 before lay, do not attain expected peak lay performance, resulting in economic losses (McMullin, 2004).

Challenges and prospects for EDS-76 virus management and control in Nigeria

Previous studies in Nigeria have shown serological evidence of EDS-76 virus in both commercial and local poultry especially in the laying flocks that were apparently healthy (Nawathe and Abegunde, 1980; Durojaiye et al., 1991; Ezema et al., 2008; Ezeibe et al., 2008). EDS-76 virus infection has been shown to be the cause of over 80% of the cases of poor egg production in Nigeria compared to other infections or environmental factors. Heavy losses are recorded annually as a consequence of the type of husbandry and management methods employed in the local and commercial poultry production. Farmers in the poultry business complain of poor egg production by their laying hens and are discouraged by the losses caused by the circulating EDS-76 virus. The majority of poultry keepers in Nigeria are ignorant of the existence of the EDS-76 virus infection. Therefore vaccination against the EDS-76 virus is not as common compared to other viral diseases, such as Newcastle disease, Gumboro disease, etc. Some approaches have been suggested for the management and control of EDS-76 virus infections: good hygiene and vaccination. While hygienic measures are of limited use in the case of very small, free-roaming flocks, they become increasingly important as soon as intensive farming is undertaken. In this situation, all the measures applied to commercial farms such as quarantine, cleaning and disinfections between batches, isolation of farms, limited access to birds and personal hygiene become necessary. EDS–76 virus is resistant to many commonly used disinfectants, but these can be effective if they are allowed to have contact with the virus for prolonged periods. Potentially contaminated water should be chlorinated before use. Composting infected chicken carcasses for 20 days completely inactivates the virus.

Inactivated vaccines are available and have been reported to decrease virus shedding (Baxendale et al., 1980). Vaccination using inactivated vaccines has been reported as an effective method of preventing and controlling EDS–76 virus infection in both commercial and local poultry (Kembi and Durojaiye, 1993; Baxendale et al., 1980), but is rarely given priority in rural communities of Nigeria where the majority of poultry are kept (Nwanta et al., 2006).

Inactivated vaccines administered intramuscularly have been reported to be effective in the control of EDS–76 virus infection and protects poultry against losses in laying performance and production of low quality eggs (Baxendale et al., 1980). Protection against challenge was demonstrated in birds vaccinated with inactivated oil adjuvant EDS-76 vaccine. Kembi and Durojaiye (1993) observed highest antibody responses in chickens vaccinated with phenol inactivated vaccine compared to formalin and heat treatment when they assessed their suitability as agents of inactivation of EDS-76 viruses for vaccination purpose. Field observation has shown that rural poultry owners do not vaccinate their birds due to the fact that most conventional vaccines, including EDS vaccines, are supplied in large doses of 200 which are too much considering the small sizes of the village flocks (5–20 birds per household). Therefore it is difficult to assemble all the local birds, from different households for vaccination. Furthermore the cold storage required of the vaccines is a problem in both the urban and rural areas of Nigeria where electricity supply is erratic or not available. Consequently, veterinarians
have to carry vaccines in portable Coleman flasks for longest distances to the site where vaccination will be carried out.

The system of poultry disease surveillance, reporting management and control in Nigeria is still inefficient. EDS-76 virus infection status and sero-evaluation has not yet been ascertained fully. Losses encountered due to EDS-76 virus infections in both commercial and local birds demoralise farmers and, in some cases, discourages them from reporting cases. This development makes epidemiological information and enforcement of control measures against important poultry diseases very difficult. The Pan African Programme For The Control Of Epizootics (PACE) in Nigeria has rarely paid attention or given priority to the epidemiology and control of important poultry diseases in commercial, village and wild birds. Poultry production, being a well known business and is an important economic activity for urban and rural dwellers in Nigeria, ought to be given priority in terms disease control. Unfortunately, diseases, especially ND, avian influenza and EDS-76, continue to be a major hindrance to the realisation of the full potential of poultry production in Nigeria. Knowledge and understanding of the prevailing status of this important poultry disease and the prevalence of the infection as well as the factors responsible for the maintenance of the virus in circulation in Nigeria is crucial for the formulation of appropriate policies and strategies for control. The control of EDS–76 and other diseases in Nigeria will not only boost productivity of poultry sector, but will also guarantee steady supply of animal protein to the human population and generate income to the poultry owners.

Inactivated vaccines against EDS–76, though not yet adopted by most poultry farmers in Nigeria for the protection of their flocks, have shown good results (Baxendale et al., 1980; Kembi and Durojaiye, 1993) and are being used in the field. Awareness needs to be raised among poultry farmers on the effectiveness of EDS–76 vaccines against both losses in egg production and prevention of poor quality eggs being laid through extension services delivery. Diagnostic centres should be strengthened and positioned for proper disease diagnosis, treatment and control. Epidemiological surveillance on the prevalence and mode of transmission of some common diseases of poultry including EDS–76 virus infection is recommended. Veterinary personnel need to take advantage of the improved transport facilities and effective communication systems in both urban and rural areas to collect appropriate specimen from farms and households for sending to suitably equipped diagnostic laboratories for analysis. This will overcome current diagnostic problems and the result can then be transmitted to and collated by appropriate agencies responsible for disease control.

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Review of Egg Drop Syndrome ’76 in birds in Nigeria: W.S. Ezema et al.


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