Foot and Mouth Disease in Nigeria- The Current Status and Control Efforts

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Abstract

Foot and mouth disease (FMD), is a highly contagious viral trans-boundary disease of both domestic and wild cloven hoofed animals characterized by high morbidity and decreased livestock productivity, while affected countries are being excluded from international animal trade. The first Nigerian reported and typed outbreak was in the early '50s amongst herds from the North-East with subsequent reports around the country. These reports confirm endemicity of FMD with serious economic losses due to serotypes A and SAT 2 outbreaks. In an update of FMD by Nwanta and Ojemiren in 1999, serotypes A, O, SAT 1 and SAT 2 were reported as being responsible for disease outbreaks in Northern Nigeria. Antibodies to SAT1 and SAT2 serotypes have also been demonstrated, while Knowles and his colleagues in 2008 reported serotype O and SAT2 from outbreaks. These findings updated the information on the FMD World Reference laboratory, (Pirbright, UK) data base which stated that serotypes O, A, SAT1 and SAT2 have been circulating in Nigeria in the last 54 years (1955-2009). Early detection is essential for effective control and requires rapid, sensitive method of viral serotype diagnosis that is responsible for the outbreak and selection of an appropriate emergency vaccine which is currently unavailable in Nigeria. This challenge forced the local herdsmen to seek for self-help medication (herbs) and a few seek the expertise of Veterinary personnel while others practice the concept called “Dashse” characterized by guarded prognosis due to absence of cross immunity amongst serotypes. Fostered collaboration with development partners as well as neighboring affected countries in areas of control is thus suggested.

Key words: Foot and mouth disease, status, control efforts, Nigeria

Introduction

Foot and mouth disease (FMD) also known as ‘aphthous fever’ or ‘infectious aphthous stomatitis’ is a highly contagious viral transboundary disease of both domestic and wild cloven hoofed animals (Di Nardo et al., 2011), characterized by the formation of vesicles in the buccal and gastrointestinal tract (rumen) mucosa, skin, especially between and above the claws of the feet, teats and udder (Kitching, 2002). Mortality is usually low, the disease decreases livestock productivity and participation in international trade of animals and animal products (Domingo et al., 2002). FMD virus (FMDV) consist of a single-stranded, positive-sense RNA genome of approximately 8,500 bases, belonging to the Family


*Picornaviridae* encoded as a large polyprotein, that is cleaved into the structural proteins and nonstructural proteins (Shao et al., 2010). There are 7 (seven) distinct serotypes which include Type A, O, C (European types), South African types (SAT₁, SAT₂, SAT₃) and Asiatic Type. Within the serotypes, many strains can be identified by biochemical and immunological tests (OIE, 2008). The cumulative incidence of FMD serotypes showed that six of the seven serotypes of FMD (O, A, C, SAT-1, SAT-2, SAT-3) have occurred in Africa, while Asia still contends with four sero-types (O, A, C, Asia-1), South America with only three (O, A, C) and periodically there have been incursions of SAT-1 and SAT-2 from Africa into the Middle East (Rweyemamu et al, 2008). Rapid and sensitive method of diagnosis is essential for early detection and effective control. In addition to the classical techniques of viral isolation in tissue culture and antigen detection by enzyme linked immunosorbent assay (ELISA), RT-PCR has become established as a reliable, fast and sensitive method of early diagnosis (Kitching, 1992) and serotype identification of FMD outbreak for selection of an appropriate emergency vaccine.

**History of Foot and Mouth Disease in Nigeria**

The earliest recorded history of FMD in Nigeria dated back to 1924 when the colonial government was setting up the Nigeria’s embryonic veterinary service (Anon, 1925). Before that period, FMD probably existed in Nigeria but was not documented. FMD was detected and diagnosed clinically among trade cattle in Borno Province in 1929 (Anon, 1929). Subsequently, the disease spread widely throughout the country amongst trade cattle along several trade routes in northern-Nigeria with little or no control measure being instituted (Anon, 1943). This resulted in sporadic outbreaks in young stocks especially during the dry season in the forties, (1946, 1947 and 1948) (Abegunde, 1987). In 1957, outbreak reports revealed serotype O was introduced by trade cattle from highland of Mambilla Plateau from the Cameroon spreading the disease to the Benue province (Anon, 1959). In 1960, the disease maintained mild epizootic status in the north eastern part of the country amongst trade cattle spreading along cattle routes with serotype A causing the outbreaks and the introduction of SAT 2 from animals from Chad which was subsequently isolated from severe outbreaks in the region. Review of FMD situation in Africa reported outbreaks in Northern Nigeria and none in the Eastern and Western parts of the country (Libeau, 1960). During the early-mid sixties, as the collection and dispatch of field samples to World Reference Laboratory, Pirbright improved, outbreak viral isolation indicated serotype A in Adamawa Province, serotype O in Bauchi Province, SAT1 in Bauchi, Borno, and Zaria Provinces while SAT2 was isolated in Zaria Province (Anon, 1965). Reviews of FMD outbreaks in Nigeria (Owolodun, 1971; Anon, 1975; Nwathe and Goni, 1976 and Asagba, 1982) documented that little information was available on FMD in Nigeria. These reviews tend to indicate that FMD virus distribution and outbreak occurrence was limited.
to the Northern states of the country amongst trade cattle moving down south. However, in the early-mid 70’s, investigations revealed outbreaks in the Western (Anon, 1974) and South-Eastern Nigeria with Serotype A and SAT 2 documented to be active in the outbreaks (Nawathe and Goni, 1976; Durojaiye, 1981). Questionnaire update confirmed serotype O, SAT1 and SAT2 while serological survey using Virus infection antigens (VIA) and 146S whole virion antigen and indirect ELISA revealed overall incidence and prevalence of 9.8% and 55% respectively (Abegunde, 1987). Update status of FMD by Nwanta and Ojemiren, (1999), indicated serotypes A, O, SAT 1 and SAT 2 have been responsible for disease outbreaks in Northern Nigeria. Chuwuedo et al., (2008) demonstrated antibodies to SAT1 and SAT 2 serotypes, while Knowles et al., (2008) reported serotype O and SAT2 from outbreaks. Recent review confirmed serotypes, O, A, SAT1 and SAT2 have being circulating in the country in the last 54 years (1955-2009) (Olabode, 2012). Serological surveys conducted between 2009 and 2011 in six Border States and two other states that host the major cattle trek showed increasing sero-prevalence in cattle sampled from Jos south LGA in Plateau state (56.3%) Ishola et al., (2011), Yobe State (82%), Plateau (80%), Ogun (77.77%), Taraba (73.50%), Adamawa (68%), Borno (67%), Sokoto (63%) cattle and Bauchi 27.84% for only sheep and goat (Lazarus et al., 2012) as well as Kwara (75.11%) (Olabode et al., 2013) as these reports confirmed increased disease endemicity with outbreaks been experienced annually due to absence of cross-immunity and heterogeneity amongst serotypes (Abdulkadir, 1989). In spite of the annual disease burden, sero-typing and molecular studies for FMD infections are inadequate due to poor understanding of the epidemiology of FMD in Nigeria. Hence, occurrence and distribution pattern of the known serotypes still remains unexploited and poorly understood.

**FMDV Status in Nigeria**

<table>
<thead>
<tr>
<th>Serotype</th>
<th>Year of occurrence</th>
</tr>
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<tbody>
<tr>
<td>Untyped</td>
<td>1920</td>
</tr>
<tr>
<td>C</td>
<td>(NIL)</td>
</tr>
<tr>
<td>Asia 1</td>
<td>(NIL)</td>
</tr>
<tr>
<td>SAT3</td>
<td>(NIL)</td>
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Challenges

In times past, lack of political will on the part of the Nigerian government to entrench control of FMD as a national priority, largely due to high financial requirement worsened the lingering and devastating impact on cattle production business in Nigeria.

The none reporting of disease outbreaks (Durojaiye, 1981) due to inefficient disease reporting system in the Nigeria (Chukwuedo et al., 2003) and this has made planning for prevention and control of the disease very difficult (Chukwuedo et al., 2008).

The lack of biosecurity as a result of the normadic /semi intensive management styles practiced by the Fulani herdsmen as well as the fragmented structure of land holdings in Nigeria favoring cross infection due cattle movements and sharing of other common service providers.

The advocated quarantine procedure at the various International, National and interstate livestock control post and control of movement which are the most feasible methods of control were unsuccessful largely due to un-controlled trading practice where cattle are moved from one market to another over a long distance of 2-3 or more ECOWAS member states. This quarantine method was also saddled with such difficulties as inadequate Veterinary staff for policing of interstate and National borders (Durojaiye, 1981).

Control Efforts

Since the advent of FMD in Nigeria attempts to control the disease has been based on quarantine and restriction of trade cattle movement. The absence of a coordinated national surveillance for FMD in Nigeria compounded with the insufficient information on the serotype occurrence and distribution has hampered the successful development and production of localized indigenous Foot and mouth disease vaccine for the control of the disease through vaccination (Olabode, et al., 2011). Although Limited scope of vaccination was conducted using imported vaccines made from non Nigerian serotype A, SAT1 and SAT2 viruses in some farms (Anon, 1977) which did not achieve desired effect under the Nigerian conditions (Mowat et al., 1975; Nawathe and Majiyagbe, 1981). However, Mowat et al., (1975) and Preston et al., (1982) showed suitable vaccine could be made from Nigerian strains and Nicholls et al., (1983) reported satisfactory protection of Nigerian cattle using inactivated vaccines formulated with Nigerian strains with revaccination within interval of six months. This vaccine was not however used on a large scale for the control of FMD in Nigeria as outbreaks continued to occur (Abegunde, 1987). This ushered in FMD control efforts of the pastoralist through a local concept called “Dashse” based on their
existing veterinary knowledge. This gave promising result which was not sustainable due to absence of cross-immunity between serotypes (Abdulkadir, 1989). Sub-stained clinical practice over several decades, amongst Veterinary personnel and livestock superintendents involved treatment of secondary bacterial infections associated with open FMD sores using parenteral antibiotics. However, success stories of clinical bovine FMD outbreak management in institutional farms was observed using 1% formalin or 10% Sodium bicarbonate solutions as debrid agent for the oral and foot vesicles or blisters, thus restoring the ability of cattle to feed/graze and walk as reported (Ogunjumo, 2004). Although, field efficacy evaluation studies for this management regimen in commercial Fulani herds is ongoing. Other mythological management practice adopted by some pastoralist to curb the course FMD include the use of herbs plus other ingredients such as honey, pepper, salts, and cooked onion leaves (Chukwedo et al., 2007). Finally, clinically un-responsive and un-productive cattle are usually culled by the herdsmen. Currently, no indigenous Nigerian strain vaccines are available (Olabode, 2012) with limited vaccination option amongst pastoralists due to the high cost of non-Nigerian vaccines.

Conclusion

Foot and mouth disease is still a serious and endemic problem of trade and production cattle in Nigeria that require urgent attention in order to salvage the non robust cattle population as well as enhance the financial capabilities and livelihood of the pastoralist and cattle trading partners of West African sub region.

Recommendations

International collaboration with development partners (FAO and OIE), Regional laboratories and other relevant stakeholders for the control FMD is therefore suggested. This would facilitate and upgrade laboratory standard through the provision of equipment as well as training of both field and laboratory personnel thus enhancing effectiveness of national surveillance and identification of current existing serotypes that would bring about indigenous FMD vaccine production.

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