



A retrospective study of viral skin diseases of cattle, sheep and goats in Plateau State, Nigeria

VI Ifende¹, NA Maurice¹, Y Abbas², C Agu¹, MB Bolajoko¹, A Jambol¹, JA Adole¹, O Asala¹, YS Wungak¹, A Maguda¹, E Umeh¹ & AJ Adedeji^{1*}

¹ National Veterinary Research Institute, Vom, Nigeria

² Ministry of Agriculture and Rural Development, Jos, Plateau State, Nigeria

*Correspondence: Tel.: +2348033559785; E-mail: yinkadeji@yahoo.com

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Abstract

Viral skin diseases namely lumpy skin disease (LSD), bovine papilloma (BP), goat pox (GTP) and contagious ecthyma (CE) have been reported in Plateau State, but our search through literatures did not reveal any documented prevalence rates of these diseases. A retrospective study of LSD, BP, GTP and CE was carried out based on Jos abattoir (2005-2016) and laboratory records of National Veterinary Research Institute, Vom, Nigeria (2010-2016). Based on the Jos Abattoir records, the prevalence rates were as follows LSD: 0.13% and BP 0.5% in Cattle. The prevalence of CE was 4.2% in sheep and 3.6% in goats. While LSD was diagnosed only in 2005, 2008 and 2016, BP was diagnosed every year except 2013, 2015 and 2016. Comparatively, CE was diagnosed in every year and month of the period reviewed. The analysis of records revealed that 11 samples were submitted for lab confirmation from suspected cases of LSD, 45.4% of which were positive by PCR. Additionally, 10 samples submitted for lab confirmation from suspected cases of GTP and 40% of the samples analyzed were positive by PCR. Of the 11 samples submitted for lab confirmation of CE, 36.4% of samples were confirmed to be CE by PCR. The laboratory results validate the Jos abattoir records which confirm that LSD, GTP and CE occur in Plateau State, Nigeria.

Keywords: Abattoir, Plateau State, Prevalence, Retrospective, Viral skin diseases

Introduction

Nigeria has a large population of livestock, with the livestock subsector contributing over 10% of agricultural GDP and hence livestock disease outbreaks can cause economic losses not just to families but communities (Fadiga *et al.*, 2013). Viral skin diseases of livestock are mostly under reported because of the perceived low mortality rates. Although they may not cause large scale mortalities, these diseases affect the productivity and economic value of affected animals. The viral skin diseases of livestock that have been reported in Plateau State,

Nigeria include: lumpy skin disease (LSD), bovine papilloma (BP) in cattle; contagious ecthyma (CE) and goat pox (GTP) in sheep and goats (Nawathe *et al.*, 1982; Meseko *et al.*, 2008; Zwandor *et al.*, 2008; Adedeji *et al.*, 2017; Adedeji *et al.*, 2018). Of these diseases, LSD and GTP are OIE listed transboundary diseases due to their ability to rapidly spread across national borders and reach epidemic proportions causing trade restrictions (Babiuk *et al.*, 2008; Tuppurainen *et al.*, 2017). Lumpy skin disease is caused by LSD virus (LSDV), while GTP is caused by

GTP virus (GTPV). These are closely related DNA viruses of the genus: *Capripoxvirus* (Tulman *et al.*, 2002). Lumpy skin disease affects cattle, buffalo and closely related-wild ruminants, while GTPV affects sheep and goats (Sharawi & El-Rahim, 2014; Tuppurainen *et al.*, 2015). Lumpy skin disease is characterized by lymphadenopathy and large, firm nodular skin lesions that are easily recognizable clinically (Beard, 2016). Morbidity and mortality rates of 14.8% and 5.3% respectively have been reported in Plateau State, Nigeria (Adedeji *et al.*, 2017). Likewise, GTP is characterized by pyrexia, generalized skin and internal pox lesions, and lymphadenopathy (Rao & Bandyopadhyay, 2000). Goat pox in endemic areas is associated with significant economic losses such as reduced milk production, loss of weight, abortion, damage to wool and in affected flocks of sheep and goats (Babiuk *et al.*, 2008). Morbidity associated with GTP outbreaks can reach 100%, and mortality of 49.5% had been reported particularly in naïve animals (Bhanuprakash *et al.*, 2011). Contagious ecthyma is a debilitating disease of sheep and goats caused by Orf virus (ORFV), a DNA virus belonging to genus *Parapoxvirus* and family: *Poxviridae* and the disease is zoonotic (Nandi *et al.*, 2011). Bovine Papilloma (BP) is caused by BP virus (BPV) which is a DNA virus belonging to the family *Papillomaviridae* (Ogawa *et al.*, 2004). Although LSD, GTP, CE and BP can be tentatively diagnosed based on clinical signs, these diseases can be confused with other skin diseases of cattle, sheep and goats based on ante mortem examination. Hence, laboratory investigations are paramount to

confirming cases of these viral skin diseases of livestock. Polymerase Chain Reaction (PCR) is a very reliable method for the confirmatory diagnosis of LSD, GTP, CE and BP (Torfason & Guonadottir, 2002; Ogawa *et al.*, 2004; Lamien *et al.*, 2011). Economically, viral skin diseases cause morbidity, mortality, damage to skin and reduce trade value of affected animals (Gambo *et al.*, 2018). Field outbreaks of viral skin diseases affecting livestock occur in Plateau State, Nigeria, but epidemiological data on the status of the diseases are few. Moreover, the prevalence rates of LSD, BP, GTP and CE in Plateau State and Nigeria are not known. In this study we take a cursory look at some of the viral skin diseases of livestock commonly diagnosed in Plateau State based on abattoir and laboratory records.

Materials and Methods

Study area

The study area was Plateau State with Jos as the administrative capital. Plateau State is located between 9.2° and 9.4°N, and between 9.3° and 9.4° E. Plateau State (Figure 1) is bordered to the North by Kaduna and Bauchi states with Nassarawa state on the southern border. It is flanked on the west and east by Nassarawa and Taraba States respectively, Plateau state has 17 Local Government Areas (LGA). The population of domestic ruminants in Plateau State is estimated as follows: 1.3million cattle, 1.8 million goats and 1.2million Sheep (DLS, 2017). The Jos Abattoir is the only government established abattoir in the Jos metropolis and it is located in Jos North Local government Area of Plateau State. This abattoir is under the Veterinary Services Division, Ministry of Agriculture Plateau State and headed by a trained veterinarian. It serves as the main source of slaughtered livestock for the residents of Jos metropolis.

Data collection

Nine years (i.e. January, 2005 to December, 2016) of Jos abattoir records were reviewed to extrapolate clinically diagnosed cases of viral skin diseases in cattle, sheep and goat based on ante mortem examination. However, data for 2009 to 2011 were excluded from this study as substantive data for these years were missing. Viral skin diseases examined were LSD and BP in cattle; while in sheep and goats it was CE and GTP. Case definition was cases of LSD, BP, GTP and CE diagnosed at the abattoir based



Figure 1: Map of Nigeria showing Plateau State

on clinical signs during ante mortem inspection. In a parallel survey, a seven year (2010- 2016) retrospective study was carried out using records of the Viral Research Division of the National Veterinary Research Institute (NVRI), Vom, Nigeria. The records were evaluated for cases of LSD, BP, GTP and CE with diagnosis confirmed from the suspected cases of these diseases. PCR was used for the confirmation of LSD, GTP and CE. There were no available records for 2005 to 2010. Ethical clearance (Ref. No: AEC/03/58/18) was obtained to enable us examine the laboratory records of Capripox Laboratory, Viral Research Division, National Veterinary Research Institute (NVRI), Vom. The Ethical clearance was obtained from the Animal Ethics Committee of National Veterinary Research Institute, Vom.

Data analysis

Data from the abattoir records were entered into Microsoft Excel 7 spreadsheet (Microsoft Corporation, Redmond, WA, USA) and stored. Open Source Epidemiologic Statistics for Public Health (OpenEpi) version 2.3.1 (Dean *et al.*, 2013) was used to obtain proportion. Descriptive statistics were used to describe the obtained data: yearly and monthly distribution of cases of LSD, CE and BP.

Results

The total number of animals slaughtered at the Jos abattoir for the years reviewed (2005-2008, 2010-2016) were 74,659 Cattle, 123,737 goats, and 64,775 sheep (Tables 1-3). LSD was recorded in 2005, 2008 and 2016 with a prevalence rate of 0.13% which represent 98 cases. However, bovine papilloma was diagnosed every year except 2013, 2015 and 2016 with an overall prevalence of 0.5% i.e. 376 cases, and highest yearly prevalence of 3.2% in 2007 (Table 1). In addition, BP was diagnosed in every month of the year, with highest number in the month of July (Figure II). Analysis of the Jos abattoir records further revealed overall prevalence of CE was 4.2% in sheep representing 2801 cases in four years (Table 2) and 3.6% in goats representing 4,457 cases in nine years (Table 3). There was no record of sheep slaughtered in the abattoir after the year 2008. Likewise, CE was diagnosed in every month of the year with the highest cases recorded in September (Figure II). Cases of GTP were not recorded during the period under review.

A total of 11 samples were submitted to the Capripox Lab, NVRI for lab confirmation from suspected cases of LSD (Figure III) between 2010 and 2016. The samples collected from 3 LGAs of Plateau State i.e. Jos North, Jos South and Kanam LGAs. 45.4% (5/11) were confirmed to be LSD by PCR.

Table 1: Yearly distribution of Lumpy skin disease and bovine papilloma diagnosed in cattle in Jos abattoir, Plateau State, Nigeria from year 2005-2008, 2012-2016

Year	Cattle slaughtered	Lumpy skin disease		Bovine papilloma	
		Cases	Prevalence (%) 95%CI	Cases	Prevalence (%) 95% CI
2005	16,868	28	0.17 (0.112-0.236)	7	0.04 (0.02-0.08)
2006	12,906	-	-	55	0.43(0.32-0.55)
2007	7,727	-	-	248	3.21(2.83-3.62)
2008	11,313	68	0.60(0.47-0.76)	26	0.22 (0.15-0.33)
2012	5,153	-	-	24	0.47 (0.31-0.68)
2013	6,299	-	-	-	-
2014	5,558	-	-	16	0.29 (0.17-0.46)
2015	4,405	-	-	-	-
2016	4,430	2	0.05(0.007-0.15)	-	-
Total	74,659	98	0.13 (0.11-0.16)	376	0.50 (0.45-0.56)

Table 2: Yearly distribution of contagious ecthyma diagnosed in sheep in Jos abattoir, Plateau State, Nigeria from year 2005-2008

Year	Sheep slaughtered	Cases of CE	Prevalence of CE (%) 95%CI
2005	18,943	25	0.13 (0.08-0.19)
2006	17,974	152	0.85 (0.72-0.99)
2007	14,650	339	2.31(2.08-2.57)
2008	13,208	109	0.82 (0.68-0.99)
Total	64,775	2,801	4.32 (4.17-4.48)

Table 3: Yearly distribution of contagious ecthyma diagnosed in goats in Jos abattoir, Plateau State, Nigeria from year 2005 to 2016

Year	goats slaughtered	Cases of CE	Prevalence of CE (%) 95%CI
2005	42,844	32	0.07 (0.05-0.10)
2006	30,260	385	1.27 (1.15-1.40)
2007	19,473	579	2.97 (2.74-3.21)
2008	28,999	140	0.48 (0.41-0.57)
2012	995	41	4.12 (3.01-5.49)
2013	843	2	0.24 (0.04-0.78)
2014	769	39	5.07 (3.68-6.79)
2015	750	83	11.06 (8.96-13.5)
2016	1,045	64	6.12 (4.78-7.70)
Total	123,737	4,457	3.60 (3.49-3.71)

The positive LSD cases occurred in year 2010, 2014, 2015 and 2016. Within the period under review, 10 samples were submitted to the Capripox Lab, NVRI for lab confirmation from suspected cases of GTP from 3 LGAs (Jos South, Langtang North, Kanam) of Plateau State with GTP confirmed by PCR in 40% (4/10) of the samples analyzed (Figure III). All the positive samples were from Kanam LGA. Eleven samples were collected from suspected cases of CE from Jos-North, Jos-South and Kanam LGA of Plateau State. 36.4% of samples were confirmed to be CE by PCR from the three LGAs where the samples were collected, although all the samples were received in 2016.

Discussion

Livestock, particularly cattle, sheep and goats are integral part of the lives of rural populace in most countries of the world like Nigeria of which they serve as source of food, income and bank or savings of money (Ørskov, 2011). From this study, the prevalence of LSD was 0.13% and BP 0.5% in cattle; while CE was 4.32% and 3.6% in sheep and goats respectively based on the Jos Abattoir records. These findings may likely represent the first documented prevalence rates of these diseases in Plateau State. Despite the low prevalence of LSD recorded in this study, this finding is important because LSD is an OIE

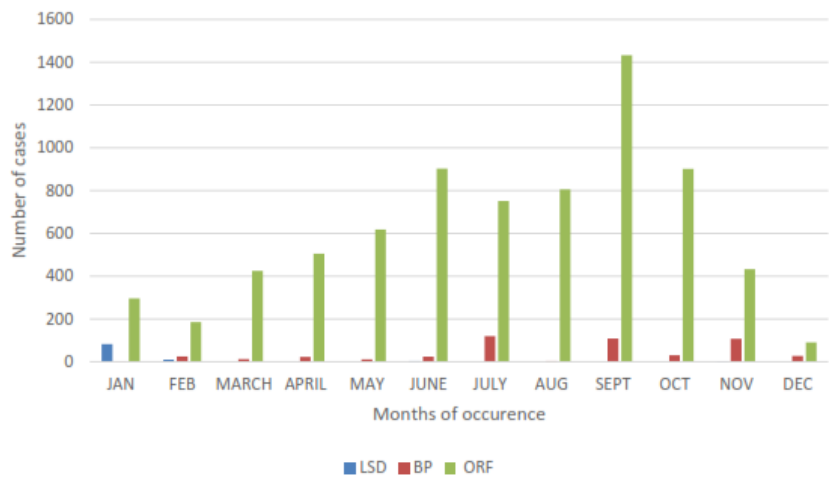


Figure II: Monthly distribution of viral skin diseases diagnosed in Jos abattoir in cattle, sheep and goats 2005-2008, 2012-2016

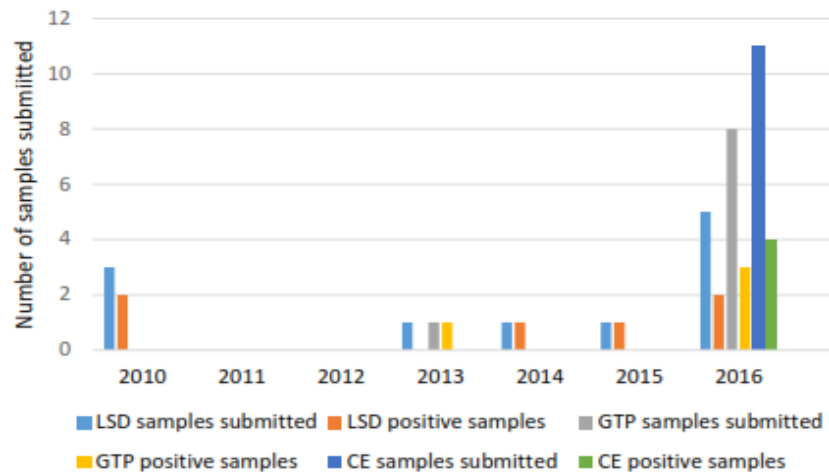


Figure III: Yearly distribution of samples collected and laboratory results of suspected cases of viral skin diseases of cattle, sheep and goats from year 2010 to 2016

listed transboundary disease of cattle and reported outbreaks of LSD can cause trade restriction (OIE 2012). Additionally, LSD was amongst the world’s top ten most important diseases of cattle according

to a report in 2011, it was also the fifth most commonly reported transboundary disease of livestock in Africa in 2014 (AU-IBR, 2014). In a recent study in a dairy farm in Nigeria, LSD was reported to have caused an estimated loss of \$17,377.05 which underlines the economic importance of the disease (Adedeji *et al.*, 2017). The prevalence of BP in this study was 0.5%; notwithstanding the low prevalence rate, the disease can cause devastating economic losses particularly in highly prized animals with severe production losses and damage to the skin of affected animals (Zwandor *et al.*, 2008). Whilst papilloma affects man and animals, it is more common in bovine species than in any other domestic animals (Borku *et al.*, 2007). In this study, CE prevalence of 4.32% (i.e. 2810 cases) was recorded in sheep, reports of CE in sheep are few in Nigeria, apart from Obi & Gibbs (1978), several other reports of CE in Nigeria had been in goats (Odo, 2003; Adah *et al.*, 2012; Adedeji *et al.*, 2017; Adedeji *et al.*, 2018). Similarly, the prevalence of CE in goats was 3.6% in the study, although Obi (1984), reported a seroprevalence of 67% in south-west Nigeria. The total number of cases diagnosed to be CE in sheep and goats based on the Jos Abattoir records were 7,258 cases and this is significant. A recent study by Adedeji *et al.* (2018) reported 100% mortality due to CE in two small holder flocks of goats in Jos, Plateau State. Another study by Windsor *et al.* (2017) in Laos suggested that CE may be a threat to the expansion of goat production in developing countries. All these studies show the need to report outbreaks of CE so that control measures can be instituted. Abattoir records are important data for epidemiological studies in developing countries because of the common practice of selling diseased animals for slaughter by livestock owners. It was of great concern to observe that no sheep had been slaughtered in this government abattoir after 2008. Further investigation revealed that unauthorized local slaughter slabs have sprung up following a civic unrest in 2008, hence sheep were no longer being brought to the abattoir. This is a limitation to our study as the prevalence of CE may be underestimated. The retrospective analysis of the laboratory records confirmed that LSD, GTP and CE cases occurred within the period of years the abattoir records were reviewed. The laboratory technique used for confirmation of these diseases was PCR which can differentiate these pox viruses in cases of multiple infections (Torfason & Guonadottir, 2002; Lamien *et al.*, 2011). Lumpy skin disease, GTP and CE were confirmed in three LGAs of Plateau

State based on the laboratory records. This indicates that these diseases may be widespread in Plateau State. Moreover, animals are brought from some of the LGAs in Plateau State to the Jos abattoir to be slaughtered. A surprising finding in this study was that GTP cases were not recorded in the Jos Abattoir records but diagnosed in the laboratory which may be as a result of missed diagnosis. Cattle, sheep and goats rearing are important for poverty alleviation in Plateau State; hence, farmers should be enlightened on the need to report outbreaks of LSD, GTP, CE and BP in their herds/flocks.

In conclusion, the prevalence of LSD, BP and CE were determined based on retrospective analysis of the Jos Abattoir records in Plateau State, Nigeria. The laboratory records further confirmed that LSD, GTP and CE occur in Plateau State. The prevalence rates of these diseases in this report have added to the knowledge of the epidemiology of LSD, GTP, CE and BP in Nigeria. Further epidemiological studies should be carried out to ascertain the prevalence of LSD, GTP, CE and BP in other parts of Nigeria.

Conflicts of Interest

The authors declare they have no conflict of interest.

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