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Retrospective Study on Laboratory results of African Swine fever Virus in Tanzania

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SUMMARY

A 10-years records on diseases was retrieved so as to investigate the occurrences of African Swine Fever (ASF) disease in Tanzania over a period of year 2007/2008 to 2016/2017. A total of 640 samples were tested for ASF virus at the Centre for Infectious Diseases and Biotechnology (CIDB), Dar es Salaam. The samples included whole blood, swabs and internal organs from domestic pigs in different areas of Tanzania. Annual, monthly and origin distribution of suspect cases was analyzed. ASF occurrences was confirmed in each year from 465 (72.6%) samples. High numbers of positive cases were in recorded in February 94 (20.2%), March 198 (42.5%), April 35 (7.5%), May 36 (7.7) and June 56 (12.0%). Regional distribution of positive samples were 45.8% from Iringa, 16.9% from Dar es Salaam, 12.3% from Mbeya, 10.3% from Coast, 9.4% from Morogoro and the remaining 0.51% were from Kilimanjaro, Rukwa, Arusha and Tanga, Kagera regions. Largest number of samples were tested in 2012/2013 (255 (39.8%) and 2011/2012 (96 (15%). The study reveals endemicity of ASF disease in Tanzania and its trend in occurrence. Further studies need to be undertaken to establish factors for the endemicity of the disease so as to mitigate its occurrence and spread for the control of the disease.

Keywords: African Swine Fever disease, endemic, Retrospective study, Tanzania.

INTRODUCTION

African swine fever (ASF) is a highly contagious and fatal disease of domestic pigs caused by double-stranded DNA virus that belongs to genus *Asfivirus* and family *Asfarviridae*. The transmission of the virus is direct and vector-borne, and the disease has sylvatic and domestic cycles. In a sylvatic cycle, it involves soft ticks of the *Ornithodoros* species and warthogs as well as in domestic pig populations with or without involvement of *Ornithodoros* ticks. The domestic cycle involves domestic pigs spreading the virus to other domestic pigs through direct or indirect contact (Penrith and Vosloo, 2009). The virus is highly resistant in tissues and the environment, contributing to its transmission over long distances (Wilkinson, 1989). Wild pigs act as reservoir hosts; this poses a constant threat to domestic pigs.

In the last two decades, pig production has shown remarkable growth in Tanzania in terms of pig population, pork production and consumption (FAO, 2005; URT, 2012, FAO, 2012a). Similar developments have been observed in other parts of Eastern and Southern Africa (ESA) countries (Waiswa et al., 2009; Mutui *et al.*, 2010, FAO, 2012b) and Asia (Delgado *et al.*, 1999; Psilos, 2008); however, the industry is hampered by ASF disease.

The aim of the study was to investigate the occurrence of ASF disease in Tanzania based on the retrospective data retrieved from CIDB for the years spanning 2007/2008–2016/2017 to give an insight in the epidemiology of the disease in Tanzania.

MATERIALS AND METHODS

Data of all samples tested for ASF virus at the Centre for Infectious Diseases and Biotechnology during 2006/2007–2016/2017 were retrieved, compiled and analysed. The samples were submitted to CIDB from different areas of the country. The types of the samples submitted were whole blood and internal organs. Examination of ASFV was done by polymerase chain reaction (PCR). DNA was extracted using a QIAamp nucleic extraction kits (Qiagen, Hilden, Germany) according to manufacturer's instructions. Examination of ASFV was done by polymerase chain reaction (PCR) targeting a conserved region of the *B646L* (p72) gene as described by Aguero et al., 2003. Data analysis was done by descriptive and inferential statistics.

RESULTS

During a period of ten years, from 2007/2008 to 2016/2017 a total of 640 samples were submitted at CIDB for diagnosis of ASF disease with average of 64 samples being submitted yearly. The total

positive cases were 465 (72.6%) and the disease was diagnosed in each year during the entire period under study. On average the annual occurrence of ASF during the 10 years retrospective study was 64

(10%). The occurrence of ASF disease according to the regions is summarized in Figure 1. It was noted that, ASF frequently occurred in Iringa, Dar es Salaam, Mbeya, Coast and Morogoro regions.

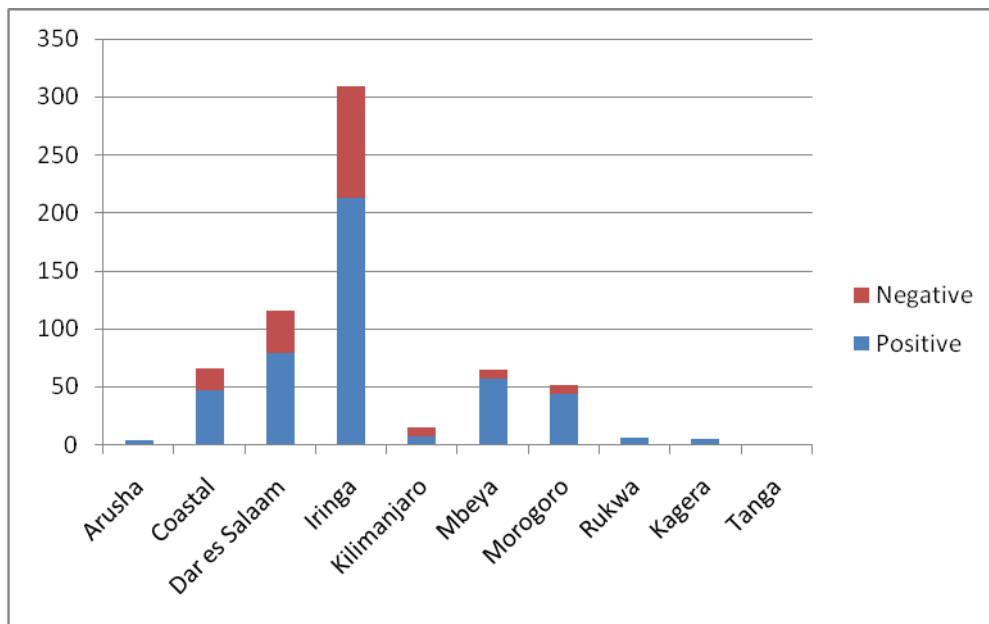


Figure 1. Regional distribution of ASFV tested samples for the period 2007/2008- 2016/2017

The high numbers of positive cases were diagnosed during February, March, April, May and June than during the remaining months of the year (Figure 2). The months of July had the lowest number of disease occurrence. According to this data, it was

apparent that the occurrence of ASF was associated with rainy season.

There is a steady sample tested with exception of the year 2012 and 2013 where the number was high 96 (15%) and 255 (39.8%) respectively (Table 1).

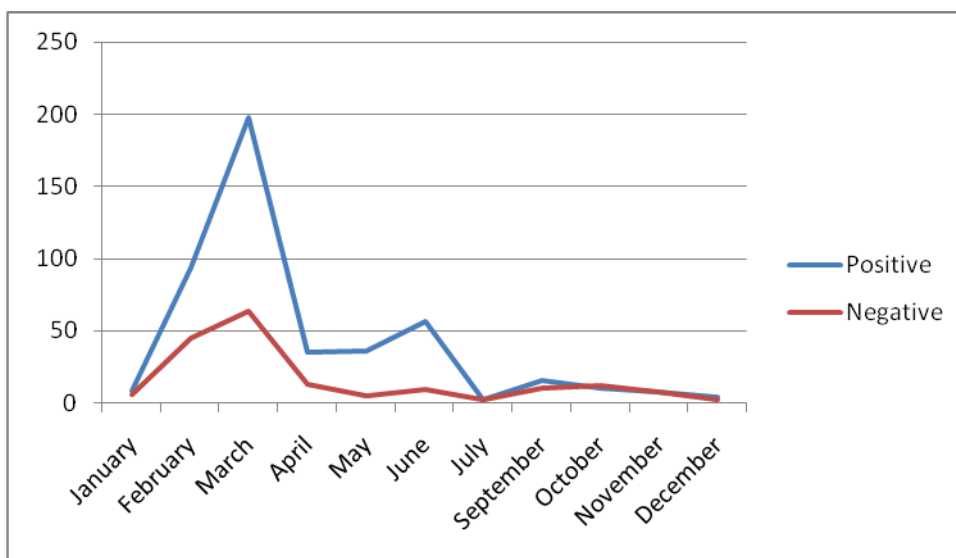


Figure 2: Monthly distribution of ASFV tested samples for the period between 2007/2008 and 2016/2017

Table 1: Annual distribution of ASFV tested samples for the period 2007/2008- 2016/2017

Year	Number of samples tested	Number (%) of positive	Number (%) of positive
2008	24	18 (2.8)	6 (0.9)
2009	56	40 (6.3)	16 (2.5)
2010	19	8 (1.3)	11 (1.7)
2011	34	22 (3.4)	12 (1.9)
2012	96	76 (11.9)	20 (3.1)
2013	255	178 (27.8)	77 (12.03)
2014	16	12 (1.9)	4 (0.6)
2015	33	24 (3.8)	9 (1.4)
2016	51	32 (5.0)	19 (3.0)
2017	56	55 (8.6)	1 (0.2)
Total	640	465 (72.7)	175 (27.3)

DISCUSSION

This study aimed at elucidating the trends of ASF disease occurrence in Tanzania based on the retrospective data retrieved from CIDB sample register books. ASF disease was suspected and confirmed annually during the entire period of the study (2007/2008-2016/2017) indicating endemic state. These findings agree with a report by the OIE which indicated that ASF is an endemic disease in Tanzania (OIE, 2010).

The distribution of ASF showed no specific pattern. However, there were higher occurrence of ASF disease in Iringa, Dar es Salaam, Coast, Mbeya and Morogoro regions and yet they have highest pig population. Most pigs in Tanzania are kept in high altitude areas, where the human population density is high and the land is of high agricultural potential. About 54% of the pigs in the country are thus found in the Southern highlands of Tanzania (SHT) regions (Mbeya, Iringa, Rukwa and Ruvuma) (URT, 2012). Pig production in most of these areas are dominated by traditional production systems and practices thus practices free ranging, characterized by small herds, low level of biosecurity and productivity.

Moreover, the consumption of pork has increased in Tanzania especially in town centres and cities with the Dar es Salaam region leading the demand. This could cause a surge in movement of pigs by traders from most parts of the country to the cities e.g. Dar es Salaam, hence the high prevalence of the disease. Transmission through direct contact can occur up to 30 days after infection. Meat from infected pigs or contaminated pork products is another source of infection due to the virus's long persistence in tissues (Costard *et al.*, 2009) and environment. Additionally, pigs recovering from infections can remain persistently infected for 6 months and act as

a source of transmission to susceptible pigs (Costard *et al.*, 2009). It is also found that in the most rural and city centres of Tanzania, pig slaughter slabs are small, poorly equipped and waste is directly accessible to other animals such as dogs or roaming pigs (personal observation); and that many pig owners sell their pigs as soon as they suspect ASF in their animals or in the neighborhoods.

Furthermore, most of these regions are adjacent to the national parks; it could be that sylvatic cycles are involved. The sylvatic cycle involves wild species of swine spreading the virus by soft ticks of the genus *ornithodoros* (Penrith and Vosloo, 2009). In Africa the major host for the ASF virus is the warthog, but all wild species of swine can be silent carriers. The wild pig and their ticks can come in contact with domestic pigs and be a source of infections especially in traditional free – ranging systems.

There were few records of occurrence of the disease in the western and lake zone regions. This difference could be partly due to underreporting, the different husbandry practices, and vigilance in disease control, animal movements and other virus transmission dynamics. In north western regions the majority of the population are pastoralists, this could be the reason that no ASF diagnose in those regions. More so the north western regions have low number of pigs (URT, 2012).

In the present study, there was a tendency to a seasonal pattern with higher frequency of ASF occurrence reported during and immediately after the months with moderate to high rainfall compared to the parts of the year with dry season. This is in contrast with the study by Atuhaire *et al.*, 2013 who were revealed that the ASF outbreaks were common during the dry season. The rain season favors the tick activities; hence increase in the transmission of the virus. Very dry season reduce survival and

increases mortality of ticks as a result of desiccation by water loss (Perret *et al.*, 2003). Apart from affecting the development and mortality, temperature and relative humidity affects tick questing, a mechanism by which ticks find a host, climb on it, and feed (Busby *et al.*, 2012).

General trend on the samples submitted showed that large numbers of samples were submitted at CIDB in 2011/2012 & 2012/2013 compared to the rest of the years. This is because there was a project on ASF diagnosis capacity building and through the project field ASF surveillance was enhanced hence many samples were collected from the field, particularly Iringa, Mbeya and Njombe regions. However, there is an increase of samples submitted for the last three consecutive years compare to the period of year 2007/2008-2010/2011. This indicates the significant mounting of the disease.

Based on the findings of this study it is concluded that there is a trend of ASF disease occurrence in the country at an average of 64 samples per year. The disease is widely distributed in the country and mostly occurs during the rainy season. It is strongly recommended that ASF control strategies should encompass a holistic chain analysis. More detailed and systematic studies should be undertaken to investigate further specific risk factors and patterns of occurrence of ASF in Tanzania.

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