Alexandria Journal of Veterinary Sciences
www.alexjvs.com

AJVS. Vol. 54: 97-100. July 2017
DOI: 10.5455/ajvs.246277

Seroprevalence of Foot and Mouth Disease, Blue Tongue Disease and Camel Brucellosis in Animals Imported into Libya

Fawzi O. Ebrahim[1], Abdul-munam M. Fellah[1], Adam Elzagheid1, Nabil S. Enattah[1], Fergani Karem[2], Fadella Abosrer[2], Kholoud Mostafa[2], Osama Alwaer[2], Almahadi Hassan[2], Milad Farhat[2], Amin Bredan[3], Nagib Elmarzugi[1]

[1] Biotechnology Research Center (BTRC), Libyan Authority for Research Science and Technology, (LARST) Tripoli, Libya, [2] National Center of Animal Health (NCAH), Ministry of Agriculture, Tripoli, Libya, [3] Independent scholar, formerly with VIB Inflammation Center and Ghent University, Ghent, Belgium

Key words:
Trans-boundary animal disease (TADs), Foot and Mouth Diseases (FMD) Blue Tongue (BTV), camel brucellosis

Correspondence to:
Fawzi Ebrahim,
fowzi.omar@yahoo.com

ABSTRACT

Transboundary Animal Diseases (TADs) pose serious worldwide risks to livestock and food security, as well as to humans. The world has been facing severe economic losses from epidemics of, for example, foot and mouth disease (FMD) and blue tongue disease (BT). After the turmoil of the Arab Spring in 2011, the patterns of livestock movement between North African countries such as Libya and sub-Saharan Africa have changed, potentially increasing the spread of TADs. We investigated the seroprevalence of FMD and BTV in sheep and cows and brucellosis in camels that had either been imported into Libya or brought illegally across the southern border. The animals were sampled in the sea ports of Tripoli and Misrata on the Mediterranean coast and in the southern city of Sabha. All the sheep and cows at the sea ports had been imported from Spain or France, and none of them was seropositive for FMD or BT. But among the sample of livestock that had come into the country illegally into Sabha, 48.7% of the sheep were seropositive for BTV and 17.5% for FMD, and 2.2% of the camels were seropositive for brucellosis. Urgent measures are needed to control the illegal influx of livestock through the southern border and to prevent the local spread of FMD and BT.

1. INTRODUCTION

Transboundary Animal Diseases are highly contagious diseases that can spread rapidly across borders. These diseases of livestock can cause high morbidity and mortality in susceptible animals (Young et al., 2014), leading to serious economic damage (Islam, 2016 ; Domenech et al., 2006) and weakening food security (Perry and Grace, 2009)

Libya is a North African country extending from the Mediterranean sea in the north to the Sahara desert in the south and is bounded on the east by Egypt, on the west by Tunisia and Algeria, and on the south by Chad, Niger and Sudan. Its area is about 1.8 million square kilometers and its population is about 6.4 million people (Gresh, 2013). Several types of TAD are prevalent in sub-Saharan regions, including foot and mouth disease (FMD), Bluetongue disease (BT) and brucellosis (Kamuanga et al., 2010) .

FMD is one of the most important diseases affecting cloven-hoofed animals, including sheep, goats and cattle (Grubman and Baxt, 2004). This highly contagious disease is harbored by different hosts and exists as seven different serotypes (O, A, C, Southern African Territories [SAT] 1, SAT 2, SAT 3 and Asia 1), which are not uniformly distributed across the world (Di Nardo et al., 2011; Brito et al., 2016). The FMD virus infection is maintained within three continental epidemiological clusters in Africa, Asia and South America (Paton et al., 2009). FMD affects economies directly by reducing animal production (Wekesa et al., 2015; FAO/OIE, 2014).

Bluetongue is an orbiviral disease caused by bluetongue virus (BTV) and affects domesticated

ruminant livestock, especially sheep and cattle (Meiswinkel et al., 2007). It is transmitted by about 30 species of biting midges of the genus Culicoides (Erasm, 1990) and is found almost worldwide (Mirjam et al., 2016; Tabachnick, 2004).

Brucellosis is a multispecies disease found on most continents. In sub-Saharan Africa, it exists in both domestic and wildlife livestock (Condy and Vickers, 1972). Brucellosis is a zoonotic disease that causes substantial morbidity and can also lead to increased rates of spontaneous abortions in humans and in livestock (Boschiroli et al., 2001). It is a serious zoonosis in North African countries and the Near East, where it causes economic and livestock losses and affects industrial production as well (Jennings et al., 2007; Abbas, 2002).

The Emergency Prevention System (EMPRES) reported that following the uprising in Libya in 2011, changes occurred in the patterns of livestock movement in the border regions between southern Egypt and Libya on the one hand and sub-Saharan Africa on the other (Knowles, 2012). Moreover, border security has been compromised on the Libyan borders with Chad, the Niger and Algeria, increasing the risk of new diseases being introduced (FAO, 2003). The aim of this work was to investigate the seroprevalence of FMD, BTD and camel brucellosis in animals imported or illegally introduced into Libya.

2. MATERIAL AND METHODS

2.1 Animals

The study was approved by the Biotechnology Research Center bioethics committee. and was conducted in accordance with relevant legislation.

A total number of 87 sheep at the sea port of Tripoli, a total number 294 cows and 277 sheep at the sea port of Misrata and a total number of 314 sheep and 325 camels at varies locations in the southern city of Sabha (Libya) were used in this study between July and October 2015.

Each blood sample of 5 ml venous blood was obtained by venipuncture of the jugular vein using sterile vacutainer needle tubes (BD Company, France). Blood samples were kept in isothermal portable containers and transported to the laboratory within a few hours. Serum was obtained by centrifugation at 2500 rpm for 15 minutes and stored at –20°C until analysis.

2.2 Seroprevalence analysis

Laboratory diagnosis of FMD, bluetongue virus and brucellosis was obtained by ELISA tests which are more sensitive and type specific (FMD-NSPC, for the detection of FMD 3ABC non-structural protein antibodies (NSP) in serum and plasma from bovine, ovine, caprine, porcine and all susceptible species, ID Screen®; Bluetongue Competition for the detection of anti-VP7 antibodies in serum or plasma from multiple species and detection of antibodies against all BTV serotypes, ID Screen®; Brucellosis Serum Indirect multi species) manufactured by ID Vet innovating Diagnostics (France). Assays were performed at the Animal Health Department in Tripoli according to the manufacturer's recommendations.

2.3 Statistical analysis

Data are presented as numbers and percentages. Chi-square test was used to evaluate the significance of differences, and $p < 0.05$ was considered significant.

3. RESULTS

A total of 1247 blood samples were obtained in Tripoli (87), Misrata (521) and Sabha (639). All the animals sampled in Tripoli or Misrata had been imported either from France or Spain. The animals examined in Sabha were sampled randomly from various locations. The distribution of the sample by animal type and sampling location are shown in table (1).

Table 1. Distribution of the sample of animals by sampling location and animal type. Animals examined in Sabha were selected randomly at several locations but the population size is unknown.

Species	Tripoli sea port		Misrata sea port		Sabha city	Total examined
	Imported n	Examined n (%)	Imported n	Examined n (%)	Examined n	
Cows	0	0	2500	249 (10.0%)	0	249
Sheep	9000	87 (1.0%)	4000	272 (6.8%)	314	673
Camels	0	0	0	0	325	325

None of the sheep and cows sampled in Misrata and Tripoli was seropositive for BTV or FMD. By contrast, the seroprevalence of these two diseases was high among animals in Sabha, where 17.5% of

the sheep were seropositive for FMD and 48.7% for BTV. Moreover, brucellosis seropositivity was observed in 2.2% of the camels tested (Figure 1).

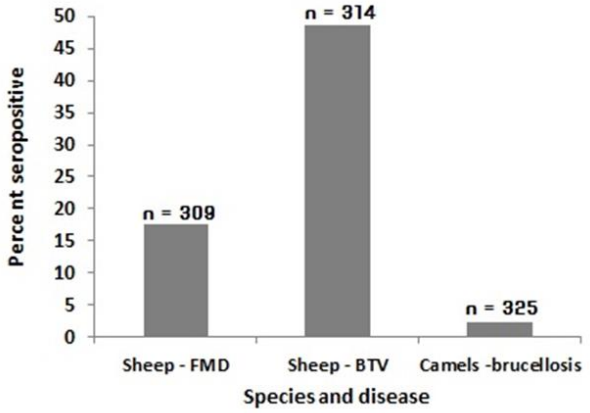

Figure 1. Seroprevalence of **FMD** and BTV in sheep and brucellosis in camels in Sabha.

4. DISCUSSION

This study was conducted at three locations. Tripoli and Misrata on the Mediterranean Sea are two of the main gateways for importing livestock and both of them have quarantine facilities. The remaining samples were obtained from the southern zone, particularly from Sabha territory. These specimens had been brought into Libya illegally across the southern border and had been in the country for a short time.

As expected, all the animals imported from France and Spain were seronegative for FMD and BTV because these countries implement rapid identification of outbreaks, impose quarantine, and slaughter all herds affected by or exposed to such diseases.

On the other hand, the samples of illegally imported sheep obtained from the southern region have a high serprevalence of BTV and FMD (Table 2). Our observed 48.7% seroprevalence of BTV in sheep is higher than the previously reported 37% seroprevalence among sheep and goats in the same region (Edrar, 2013).

As for FMD in the Sabha region, we observed 17% seroprevalence. According to the Emergency Prevention System at the United Nations Food and Agriculture Organization, separate outbreaks of SAT2 have been detected in Libya in 2012 (FAO/UN, 2012). According to the European Centre for Diseases Prevention and Control (ECDP), 13 FMD outbreaks were reported to the OIE National Centre of Animal Health and Breeding Improvement in Tripoli, Libya. The first outbreak occurred on 18 December 2011 and was confirmed on 31 January 2012. The outbreaks affected cattle, sheep and goats across 13 geographical areas in northern Libya (ECDP, 2012). Furthermore, OIE reported that Libya has been classified as intermediate outbreak notification for FMD (Vosloo et al., 2002). Moreover, foot and mouth disease is endemic in nearly all countries of sub-Saharan Africa, but most outbreaks are not recorded (Samuel et al., 2001).

Furthermore, 2% of the camels examined in Sabha were seropositive for brucellosis, which is very low compared to the seroprevalence of FMD and BTV in sheep. Camel brucellosis was first diagnosed in Libya in 1993 (Gameel et al.,1993). According to several studies, countries sharing borders with Libya, such as Sudan, Chad and Niger, have taken measures to control camel brucellosis (Omer et al., 2010; Schelling et al, 2003). Evidently, similar effective measures are needed against FMD and BTV. There is a need to improve reporting, diagnosis, surveillance and monitoring of animal diseases in general and TADs in particular. Additional studies are needed to develop implementable strategies to prevent and control these diseases.

5. CONCLUSION

We conclude that animals imported from Spain and France were free of FMD and BTV, but a large proportion of animals transported into Libya across the southern border have been exposed to these diseases. Measures are needed to monitor the health of livestock crossing the southern Libyan border until such time that the authorities can control the border and the illegal influx of livestock across it.

6. ACKNOWLEDGEMENTS

We thank the International Atomic Energy Agency (IAEA) for providing the ELISA kits, and the National Center of Animal Health and the Biotechnology Research Center, Tripoli, for providing facilities.

7. REFERENCES

Abbas, B., Agab, H. 2002. A review of camel brucellosis. Prev Vet Med. 55:47-56.

Boschiroli, M.L., Foulongne, V., O'Callaghan, D. 2001. Brucellosis: A worldwide zoonosis. Curr Opin Microbiol. 1(4):58-64.

Brito, B.P., Jori, F., Dwarka, R., Maree, F.F., Heath, L. and Perez, A.M. 2016. Transmission of Foot-and-Mouth Disease SAT2 Viruses at the Wildlife-Livestock Interface of Two Major Transfrontier Conservation Areas in Southern Africa. Front in micro. 7: 243-238.

Condy, J.B., Vickers, D.B. 1972. Brucellosis in Rhodesian wildlife. J S Afr Vet Assoc. 43(2):175-179.

Domenech, J., Lubroth, J., Eddi, C., Martin, V., Roger, F. 2006. Regional and international approaches on prevention and control of animal trans-boundary and

emerging diseases. Ann N Y Acad Sci.1081:90-107.
European Center for Disease prevention and Control. 2012. Transmission of Foot and Mouth disease to humans visiting affected areas. Rap Risk Assess. 1-4.
Edrar, A. 2013. Some Result of FMD, PPR and BTV in Libya.Tunis meeting 2013.
Erasm, B.J. 1990. Bluetongue virus. In Virus Infections of Ruminants. New York, Elsevier Science Publishers. 3:227-237.
FAO/OIE, 2014. The global framework for the progressive control of trans-boundary animal diseases (GF-TADs). Joint FAO/OIE initiative.
Food and Agriculture Organization of the United Nations. 2012. Available at: www.fao.org/empres.
Gameel, S.E., Mohamed, S.O., Mustafa, A.A., Azwai, S.M.1993. Prevalence of camel brucellosis in Libya. Trop Animal Health Prod. 25(2):91-93.
Grech, J. and Bamber, M., 2013. Why Invest in Libya. Kpmg Malta.
Grubman, M.J., Baxt, B. 2004. Foot-and-mouth disease. Clin Micr revi. 17(2):465-493.
Islam, M.A., 2016. Transboundary diseases of animals: Concerns and management strategies. Res Agric Livest Fish. 3(1):121-6.
Jennings, G.J., Hajjeh, R.A., Girgis, F.Y., Fadeel, M.A., Maksoud, M.A., Wasfy, M.O., El Sayed, N., Srikantiah, P., Luby, S.P., Earhart, K. and Mahoney, F.J. 2007. Brucellosis as a cause of acute febrile illness in Egypt. Trans R Soc Trop Med Hyg. 7(101):707–713.
Kamuanga, M.J., Somda, J., Sanon, Y., Kagoné, H. 2010. Livestock and regional market in the Sahel and West Africa: Potentials and challenges. Available at: www. donorplatform.org/component/option,com_docman/task ,doc _view/gid,1357/Itemid,98/ (accessed on 14 October 2010).
Knowles, N.J. 2012. Foot-and-mouth disease – Middle East: Egypt, Libya, Palestinian Authority, Genotyping. Promed. 20120507.1125683.
Meiswinkel, R., Van Rijn, P., Leijs, P., Goffredo, M. 2007. Potential new Culicoides vector of bluetongue virus in northern Europe. The Veterinary record.161:564-565.
Mirjam, T.W., Smit, A.J., Moormann, R.J. 2016. Vector independent transmission of the vector-borne bluetongue virus. Crit Rev Micro. 42(1):57-64.
Di Nardo, A., Knowles, N.J., Paton, D.J. 2011. Combining livestock trade patterns with phylogenetics to help understand the spread of foot and mouth disease in sub-Saharan Africa, the Middle East and Southeast Asia. Revue scientifique et technique (International Office of Epizootics). 30(1):63-85.
Omer, M.M., Musa, M.T., Bakhiet, M.R., Perrett, L. 2010. Brucellosis in camels, cattle and humans: associations and evaluation of serological tests used for diagnosis of the disease in certain nomadic localities in Sudan. Rev Sci Tech. 29(3), 663-669.
Paton, D.J., Sumption, K.J., Charleston, B. 2009. Options for control of foot-and-mouth disease: knowledge, capability and policy. Philos trans Roy Soci Lond. Series B, Biol scie. 364(1530):2657-2667.
Perry, B., Grace, D. 2009. The impacts of livestock diseases and their control on growth and development processes that are pro-poor. Philos trans Roy Soci Lond. Series B, Biol scie. 364(1530):2643-2655.
Samuel, A.R. and Knowles, N.J. 2001. Foot-and-mouth disease type O viruses exhibit genetically and geographically distinct evolutionary lineages (topotypes). J gen Virol. 82(3):609-621.
Schelling, E., Diguimbaye, C., Daoud, S., Nicolet, J., Boerlin, P., Tanner, M., & Zinsstag, J. (2003). Brucellosis and Q-fever seroprevalences of nomadic pastoralists and their livestock in Chad. Prev Vet Medi, 61(4):279-293.
Tabachnick, W.J. 2004. Culicoides and the global epidemiology of bluetongue virus infection. Veterinaria Italiana. 40:145-150.
Vosloo, W., Bastos, A.D.S., Sangare, O., Hargreaves, S.K., Thomson, G.R 2002. Review of the status and control of foot and mouth disease in sub-Saharan Africa. OIE Revue Scientifique et Technique.21(3):437-445.
Wekesa, S.N., Sangula, A.K., Belsham, G.J., Tjornehoj, K., Muwanika, V.B., Gakuya, F., Mijele, D. and Siegismund, H.R. 2015. Characterisation of recent foot-and-mouth disease viruses from African buffalo (Syncerus caffer) and cattle in Kenya is consistent with independent virus populations. BMC Vet Res. 11(1):1-15.
Young, J. R., Nampanya, S., Khounsy, S., Bush, R. D., Windsor, P. A., 2014. Improving Trade in Large Ruminants and Products by Transboundary Animal Disease Control in Lao PDR. GSTF J Vet Sci. 19:1(1).