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Mapping of Reproduction Disorders Caused by Infectious Diseases in Bali Cattle (*Bos sundaicus*) in Muna Regency, Indonesia

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ABSTRACT

Background: The Government of Muna Regency, Southeast Sulawesi Province, in Indonesia, made Bali cattle a leading livestock commodity. The problem faced by farmers is the slow increase in population, which is caused by reproduction disorders. Mapping of animal diseases can be used as a guide in determining the location of cattle farming development. This study aims to determine the spread of infectious diseases found in Bali cattle in the Muna Regency. A total of 27 blood samples were obtained from the jugular veins of the cattle in Muna Regency in 9 sub-districts, that were suspected to have an infectious disease.

Methods: The samples were then tested using the ELISA method for *Septicaemia epizootica*, Infectious Bovine Rhinotracheitis and Trypanosomiasis, while the test for Brucellosis was conducted in parallel between RBT and CFT.

Result: Brucellosis and Infectious Bovine Rhinotracheitis were absent, however, the prevalence of *Septicaemia epizootica* disease was in all regions. Trypanosomiasis disease is found in 55.5% of Bali cattle breeding centers in Muna Regency, in adjacent areas, *Septicaemia epizootica* was the disease with the highest rate of infection followed by Trypanosomiasis which was partial in some regions.

Key words: Bali cattle, Infectious diseases, Reproduction disorders.

INTRODUCTION

Bali cattle are one of the local germplasm of Indonesian beef cattle (Purwantara *et al*., 2012) that needs to be developed through a gradual, directed and sustainable increase in population. This is because it has several advantages compared to other local Indonesian cattle such as rapid growth (Labatar and Aswandi, 2017), good reproductive performance, (Hakim *et al*., 2008) and ability to adapt to the environment.

Bali cattle migrated from Bali island to South Sulawesi in 1920 and 1927. Southeast Sulawesi is one of the regions in Indonesia that is the center of development of beef cattles. According to (BPS Sultra, 2018), Muna Regency ranks first in the beef cattle population of 56, 596. Therefore, the Government made beef cattles a leading livestock commodity. Nine subdistricts are designated as centers for increasing the population of beef cattle, especially in Muna Regency, namely, Napabalano, Watopute, Lasalepa, Bone, Parigi, Kabawo, Kabangka, Tongkuno and South Tongkuno Subdistricts (Saili *et al*., 2018).

Based on the animal disease monitoring report by the Muna District Livestock Office (2018), it was stated (Saili *et al*., 2018) that the incidence of disease in large ruminant livestock include Injury (832 cases), Tympani (135 cases), Miasis (498 cases), Scabiesis (495 cases), Helmintiasis (2946 cases), Thaleziasis (2581 cases) Dystocia (35 cases), Poisoning (62 cases) and Reproductive Disorders (120 cases). There have been no reports on the incidence and spread of infectious reproductive diseases caused by factors either directly or indirectly affecting the reproductive performance of Bali cattle in the Muna Regency.

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Reproductive disorders caused by infectious factors commonly found in Bali cattle farms in Indonesia are Trypanosomiasis (Sulaeman *et al*., 2019), Brucellosis (Muflihanah *et al*., 2013), Septicemia Epizootica (Berek *et al*., 2015) and Infectious Bovine Rhinotracheitis (Adjid, 2004). Furthermore, some of them are included in the type of infectious reproductive diseases that needs to be handled properly because they would interfere with the reproduction process.

MATERIALS AND METHODS

This research was conducted from June to November, 2020. The research locations were conducted in 6 sub-districts in Muna Regency, Southeast Sulawesi, Indonesia. The sample types used in this study were blood collected from the jugular

veins of Bali cattles (multy ages) with clinical symptoms of Brucellosis, Septicemia epizootica (SE), Infectious Bovine Rhinotracheitis (IBR) and Trypanosomiasis. A total of 27 samples were collected from suspected areas where the disease was believed to originate from. The collected samples were then analyzed on Balai Besar Veteriner Maros.

The blood samples were tested using the Rose Bengal Test (RBT) and complement fixation test (CFT conducted in parallel for disease testing Brucellosis. The positive results of RBT were further tested with the CFT method. This test was based on the procedure performed by (Godfroid *et al*., 2010). The ELISA test is also used to detect the incidence of SE, IBR and Trypanosomiasis by following the work procedures carried out by (Lequin 2005).

Spatial analysis was used in determining the patterns and spread of animal diseases in the research area. The first disease mapping was conducted by Jhon Snow in 1849 by isolating the region based on the incidence of cholera in England (Hay *et al*., 2013; Barford and Dorling, 2016). In this study, the data analysis techniques were used in the form of buffer and overlay analysis. The Buffer technique was used to identify and limit the study area, while overlay was used in presenting the data integration results from both primary and secondary data.

RESULTS AND DISCUSSION

Test results for 27 samples in Brucellosis, Trypanosomiasis, IBR and SE showed mixed results and different incidence rates. Furthermore, Brucellosis and IBR diseases showed negative results, while SE and trypanosomiasis had a prevalence of 100% and 55.66% respectively (Table 1).

The first report of brucellosis in Indonesia was in 1915 (Novita, 2016). In 2012 this disease was present in the islands of Sulawesi with 21.9% prevalence in South Sulawesi (Muflihanah *et al*., 2013). The incidence of Brucellosis poses a threat to the development of cattle farms. The main predisposes factors that make this disease transmitted rapidly in Indonesia are maintenance patterns especially in traditional systems (Nugroho *et al*., 2019), low preventive measures (vaccination) (Martindah and Noor, 2018) and improper post parturition handling (Avila-Calderón *et al*., 2013).

Table 1 shows that the incidence of SE reached about 100% (27/27) in the Bali cattle development area in Muna Regency. It is caused by *Pasteurella multocida* which is an infectious disease that is acute in cattle and buffalo and causes considerable economic loss (Benkirane and De Alwis, 2002). Reproductive disorders due to this disease occur indirectly due to spontaneous weight loss (abortus) (Saminathan *et al*., 2016) and fertility failure due to decreased nutrient intake (Chung *et al*., 2015).

Table 1: Results of serological testing of Bali cow blood samples in Muna Regency.

Types of diseases	Number of samples	Positive	Sample presentations (%)
Brucellosis	27	0	0
SE	27	27	100
Trypanosomiasis	27	15	55.56
IBR	27	0	0

Septicemia epizootica is widely reported in tropical countries especially in Asia and Africa (Benkirane and De Alwis, 2002). This was first reported in Indonesia in 1884 in Balaraja and Tangerang (Yohanes and Theresia, 2012). Furthermore, It was stated that SE is endemic in several beef cattle development areas in Indonesia such as Nusa Tenggara and Sulawesi Island (Agustini *et al*., 2014). In general *Pasteurella multocida* found in Asia including Indonesia comes from serotype B (Orynbayev *et al*., 2019) which was later developed into an isolate vaccine (Dabo *et al*., 2008) to prevent the spread (Mostaan *et al*., 2020).

Trypanosomiasis is caused by blood endoparasites (*Trypanosoma sp*) which lead to premature birth and infertility (testicular damage) and decreased milk production (Mamoudou *et al*., 2016). The results of this study showed 55.56% incidence of this disease (15/27) in some areas in Muna Regency. Trypanosomiasis is mechanically transmitted by blood-sucking flies and their influence on the host varies depending on certain factors, namely the effectiveness of transmission by mechanical vectors, suitability, the vulnerability of the host and the ability of parasites to adapt (Misra *et al*., 2016). The host of *Trypanosoma evansi* ranges from wild to domestic animals. Examples of domestic animals that are susceptible to surra disease include horses, cows, buffaloes, goats, sheep, pigs, dogs and cats.

The results of this study showed that Muna District has not been exposed to Bovine Herpesvirus 1 (BHV-1) which is the major cause of Infectious Bovine Tracheitis disease in ruminant animals. In Indonesia, the incidence of IBR disease has been reported in several areas of beef cattle development centers such as in Sumatra (Aceh and North Sumatra), Java, Sumbawa and Nusa Tenggara (Hidayati *et al*., 2019). It was first reported in Indonesia in 1982 by the Center for Animal Disease Investigation region III Lampung in collaboration with JICA, using a neutralization serology test (Kristianingrum *et al*., 2015). Furthermore, the Center for Veterinary Research, Bogor also reported that in 1985, the IBR isolates serologically came from imported cows and buffaloes. According to the study by (Damayanti and Sudarisman, 2005), it was stated that Bali cattle are species that are susceptible to BVH-1 even though the clinical symptoms begin to disappear 21 days after infection, with the main source of infection coming from exposed bull semen. Transmission could occur through natural mating or artificial insemination (AI) (Nandi *et al*., 2009).

The farming community in Muna Regency sees farming as a side job and livestock as a form of investment. Furthermore, breeding culture are found in regions where cattle are released wild on grazing or plantation lands (extensive). Therefore, this study focused on the pattern of disease spread in several subdistricts that are the center of Bali cattle development. Two main factors that influence the spread of disease in livestock include (1) climate relationship

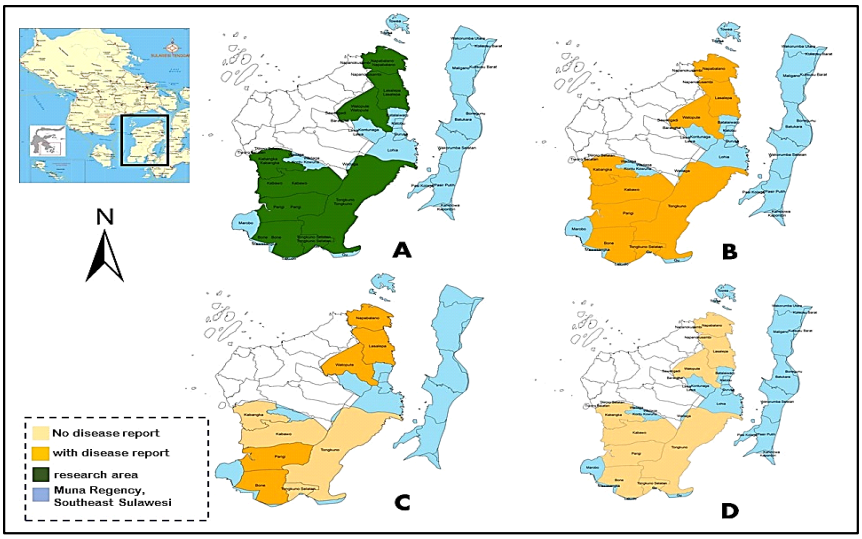

Fig 1: Map of the spread of infectious animal diseases (Brucellosis, SE, IBR and Trypanosomiasisa) on cattle in each subdistrict in Muna. The study area (A), the spread of SE disease (B), the spread of Trypanosomiasis disease (C) and incidence of Brucellosis and IBR (D).

with ecosystem balance, especially the pattern of activity of disease-causing microorganisms, (2) globalization concerning maintenance patterns where there is a shift in land use due to trading activities, population growth and food supply chain (Wilkinson *et al*., 2011).

The results of this study showed that SE was the disease with the highest form of contraction and its incidence was found in all study areas. Furthermore, the diseases with a high rate of infection were found in Tryphanosomiasis with 55.56% occurrence and it only occurred in some sub-districts. There was also no incidence of Brucellosis and Infectious Bovine Tracheitis diseases (Fig 1).

The overlay results on the spread of disease and regional ecosystems show that the reports of SE and Trypanosomiasis in Bali cattle are commonly found in coastal typology. Furthermore, climate factors contribute to the spread of livestock diseases. This region has a total rainfall of 1188 mm/year with an average air temperature of 27, 15°C and humidity of 80.30% (BPS Sultra, 2020). These conditions fall into the category of dry climate which has a negative impact on the limitations of feed and water resources for livestock and results in malnutrition and weight loss. Malnutrition is one of the leading causes of *Trypanosoma evansi* infection (Reid *et al*., 2001). It has the potential to increase when cases in the region are not immediately resolved because it is acute and contagious in ruminants. Therefore, it is believed that the disease of SE and Trypanosomiasis is still the main problem that farmers experienced and they are characterized by their high rate of infection.

CONCLUSION

The concluded that Septicemia Epizootica and Trypanosomiasis were the diseases with the highest rate of infection and, the Muna district was still free of Brucellosis and Infectious Bovine Rhinotracheitis.

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Conflicts of interest: None.

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