Global Veterinaria 14 (2): 178-184, 2015
ISSN 1992-6197

DOI: 10.5829/idosi.gv.2015.14.02.9257

Release Assessment of Introducing Rabies Virus from Distric of Sukabumi Into Jakarta Province Through Dogs

[1]Vitasari Safitri, [2]Etih Sudarnika and [2]Denny Widaya Lukman

[1]Directorate General of Livestock and Animal Health Services,
Bld C 9th Fl.Jl. Harsono RM No.03, Ragunan, Jakarta Selatan
[2]Veterinary Public Health, Veterinary Medicine Faculty,
Bogor Agricultural University, 2 Jl. Agatis Kampus IPB Darmaga, Bogor, Indonesia

Abstract: Rabies is a zoonotic disease that has serious consequences for human and animal health. The lack of dogs movement control from rabies infected areas to free areas is a threat of rabies virus entry. The purpose of this study was to conduct a release assessment of risk analysis on the introducing of rabies virus from Sukabumi distric to Jakarta Province through stray dogs. Data collection was done using expert opinion, in-depth interviews, direct observation, scientific publications and written or unpublished data (statistics, documents and reports from the competent authority). The respondents of this study were the owners of dog meat restaurant, slaughtermans, butchers, traders, services officers and experts. In this study, the biological pathway of release assessment was developed. The likelihood in the every step in the pathway was identified and assessed for determination of risk estimation. The result of the release assessment of risk analysis on the introducing of rabies virus from Sukabumi distric to Jakarta Province through stray dog was high with the low uncertainty, whereas through the dog meat was low with the low uncertainty.

Key words: Dog · Rabies · Release Assessment

INTRODUCTION

Rabies is a viral disease that affects the central nervous system (CNS) of mammals and has an extremely high case fatality rate. Once clinical signs develop, there are very few survivors [1]. Rabies, the most fatal of all infectious diseases, remains a major public health problem and causes severe economic impact in many developing countries [2].

Distric of Sukabumi is the one of rabies-infected area according to the Decree of Minister of Agriculture No. 3600/Kpts/PD.640/10/2009, then movement of dogs from Distic of Sukabumi (rabies-infected area) to Jakarta Province (rabies-free area) is prohibited. However, it is very difficult to implement the regulation because of the absence of natural barrier among the areas and the absence of observation station in the areas. They cause illegal dog movement from Distric of Sukabumi to Jakarta Province, generally for consumption.

Dog meat is consumed by many people in Asian countries, including Viet Nam, South Korea, the Philippines, Laos, Myanmar, Cambodia, Thailand, India, Kazakhstan and the People's Republic of China. Eating dog meat is believed to improve the health and make longevity [3]. In Indonesia, dog meat is consumed by people in some regions, such as in Medan, Jakarta, Bandung, Yogyakarta, Solo, Bali and Manado. Dog meat menu are like *rica-rica* and *tongseng* usually sold as street food in several major cities [4].

Restaurants that sell dog meat menu in Jakarta Province are quite a lot and crowded visited. This is one of the entry of rabies threat to Jakarta Province with a sufficient number of dogs entrance to supply the restaurant from infected rabies areas, among others, of Distric of Sukabumi. According to Mau and Desato [5], uncontrolled movement flow was a critical aspect for controlling rabies in the area.

Corresponding Author: Vitasari Safitri, Directorate General of Livestock and Animal Health Services,
Bld C 9th Fl.Jl. Harsono RM No. 03, Ragunan, Jakarta Selatan.

Rabies being the most frequently (83.3%) known disease [6]. Dogs have been identified as being primarily responsible for the transmission of rabies in human and other domestic animals [7]. Dogs were the primary cause (90.4%) for the human rabies post exposure prophylaxis [8]. Rabid dog throughout the world affect human being, due to its close association with human [9]. Transmission of rabies usually occurs through the bite of an infected-animal or if saliva or tissue from infected-animal exposed to an open wound at the time of the conduct alleged animal section [10]. Wertheim *et al*. [3] also stated that slaughtering the unvaccinated-dog in rabies endemic countries should be considered a risk factor for transmission of rabies. Preparation of infected dog brains has most likely a transmission of rabies infection through the conjunctiva, oral mucosa or nasopharynx. Rabies transmission can also occur when there are abrasions on the hands of workers while cutting the carcass of an infected dog.

Cases of rabies transmission from animals to humans associated with the consumption of rabies-infected meat have been reported, two victims died in Vietnam in 2009 [3]. Weng *et al*. [11] conducted a study on risk of dogs transmision in Taiwan. Smuggling dogs can pose a great risk to the emergence of rabies in Taiwan.

Study on the risk of rabies through dog-meat consumption transmitted from Distric of Sukabumi to Jakarta Province has never been done. It is attracted researchers to study further about transmission of dogs from the region. This study was aimed to assess the risk of rabies virus entry through dog meat consumption transmitted from Distric of Sukabumi to Jakarta Province.

MATERIALS AND METHODS

Time and Place: The study was conducted from March 2014 to July 2014. The study was conducted in dog meat restaurants, slaughter houses and traditional markets in Jakarta Province and traders of dog in Distric of Sukabumi.

Data Collection for Variable/Variable Input: The data used in this study included primary data and secondary data. Primary data collection techniques were done using expert opinion elicitation, in-depth interviews and direct observation in the field. Secondary data obtained from scientific publications and written or unpublished data (statistics, documents and reports from the competent authority).

Determination of Input Variables Respondents: Determination of the respondents with respect to the flow of input from the *consumed-dogs* from Sukabumi distric to Jakarta Province, as listed in Table 1.

Qualitative Risk Assessment

Release Assessment: Each of risk pathway and the risk of rabies infection in dogs, animals transmitting rabies and

Table 1: Respondents inclusion consumed dogs from Sukabumi distric distric to Jakarta

No.	Respondents	Number	Description
1	The owner of dog-meat restaurants	30	Purposive sampling or selection of intentionally taking into account the location of the restaurants and the willingness of respondents to be interviewed
2	Burchers	7	Selection based survey respondent no. 1 were in Central Jakarta, West Jakarta, East Jakarta and North Jakarta
3	Slaughtermans	5	Selection based survey respondent no. 1 and 2 were in East Jakarta
4	Traders	5	Selection based on the representation of small-scale traders, middle and large in the area of Distric of Sukabumi
5	Government officers	6	Selection in accordance with the number of districts / cities where entry (5) and exit (1)
6	Experts	5	Assessment of interest pathway identified risk, the potential interest of opinions regarding the origin of the dog and the dog collectors, the spread of rabies to Jakarta Province

Table 2: Categories possibility (likelihood) and its interpretation in the assessment of the release (Biosecurity Australia 2001)

The possibility (likelihood)	Interpretation
High	The even would be very likely to occur
Moderate	The even would occur with an even probability
Low	The even would be unlikely to occur
Very low	The even would be very unlikely to occur
Extremely low	The even would be extremely unlikely to occur
Negligible	The even would almost certainly not occur

Table 3: A matrix of rules for combining descriptive likelihoods (Biosecurity Australia 2001)

		Likelihood 2					
		high	moderate	low	very low	extremely low	negligible
Likelihood 1	high	high	moderate	low	very low	extremely low	negligible
	moderate	moderate	low	low	very low	extremely low	negligible
	low	low	low	very low	very low	extremely low	negligible
	very low	very low	very low	very low	extremely low	extremely low	negligible
	extremely low	extremely low	extremely low	extremely low	extremely low	negligible	negligible
	negligible	negligible	negligible	negligible	negligible	negligible	negligible

Table 4: Categories of qualitative uncertainties (EFSA 2006)

Category Uncertainty (Uncertainty)	Interpretation
Low	There are solid and complete data available; strong evidence is provided in multiple references; authors report similar conclusions
Medium	There are some but no complete data available; evidence is provided in small number of references; authors report conclusions that vary from one another
High	There are scarce or no data available; evidence is not provided in references but rather in unpublished reports or based on observations, or personal communication; authors report conclusions that vary considerably between them

humans assessed by qualitative approach. Assessment was done by using the six categories of the possibility (likelihood) that refered to the Biosecurity Australia [12]. Category possibility (likelihood) and the interpretation were presented in Table 2.

Qualitative likelihoods could be assigned to individual steps in scenario, then some form of combination rule would be needed for calculating the probability that the entire scenario wouldl accur. Rules could be displayed in various formats, but the most intuitive was a two-by-two tabular matrix, such as shown in Table 3 [12].

Uncertainty: Uncertainty indicates the spread of values that a variable can take because lack of knowledge about the possible values. Collecting more data or information about a variable can reduce uncertainty [13]. Alleged risk has a degree of uncertainty (uncertainty) and expressed qualitatively by three categories [14] were presented in Table 4.

RESULTS

The flow of Consumed-Dog Movement from Distric of Sukabumi to Jakarta Province: Life dogs for consumption from Distric of Sukabumi, derived from hunting-dogs culled, stray dogs and pet dogs. Entrance of these dogs were mostly from stray dogs, so the pathway would be discussed further.

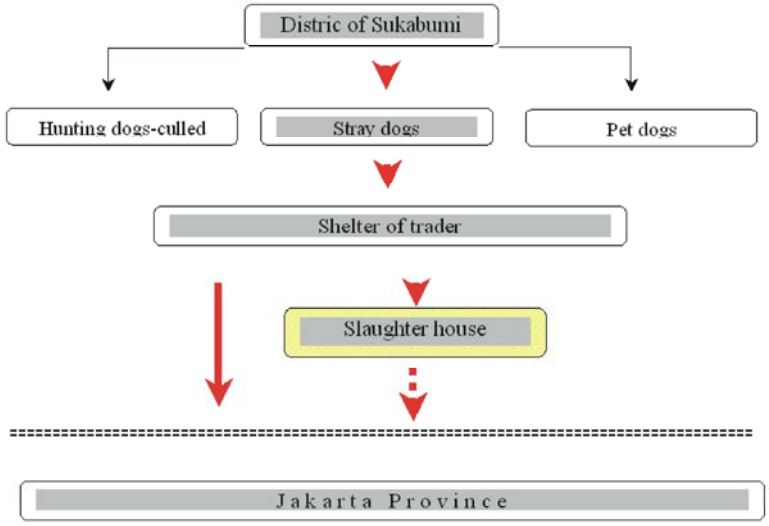
Dogs that would be sold as the consumed-dog would be collected in advance in shelters belonging to traders in Distric of Sukabumi. Based on the survey results, there were two types of entrance. The first type, life dogs sent directly from Distric of Sukabumi to the slaughter houses in Jakarta Province. The second type, consumed dogs originating from Distric of Sukabumi delivered to slaughterhouse in Bogor (Cibubur and Cibinong) and Bekasi, which would then be sent to Jakarta Province in the form of meat. The flow of consumed-dog movement detailly is presented in Figure 1.

Based on expert's opinion, the risk of pathway of stray dogs has a major role in the introduction of rabies virus from Distric of Sukabumi to Jakarta Province. Estimated, from 100 dogs that entered to Jakarta Province, there were 60 originated from stray dogs.

Stray dogs did not have a good vaccination status. According to Putra [15], based on the results of his research in Bali, rabies incidence rate was highest among stray dogs, approximately 81%. Cases of rabies in stray dogs presumably was high because the level of contact between dogs was quite intense compared to a pet dog. Another reason because of difficulty in doing vaccination to stray dogs through injections, so the process of transmission of rabies was difficult to discontinued.

Release Assessment

The Assessment of Rabies Virus from Distric of Sukabumi to Jakarta Province via Stray Dogs as Consumed Dog: Stray dogs that enter from Distric of Sukabumi to Jakarta Province were in the form of life dogs and dog meat. Flow of rabies virus release in stray dogs as in Figure 2.



Remark:
= not surveyed; → = life dogs pathway; --> = meat/carcass pathway
Fig. 1: The flow of consumed-dog movement from Distric of Sukabumi to Jakarta Province

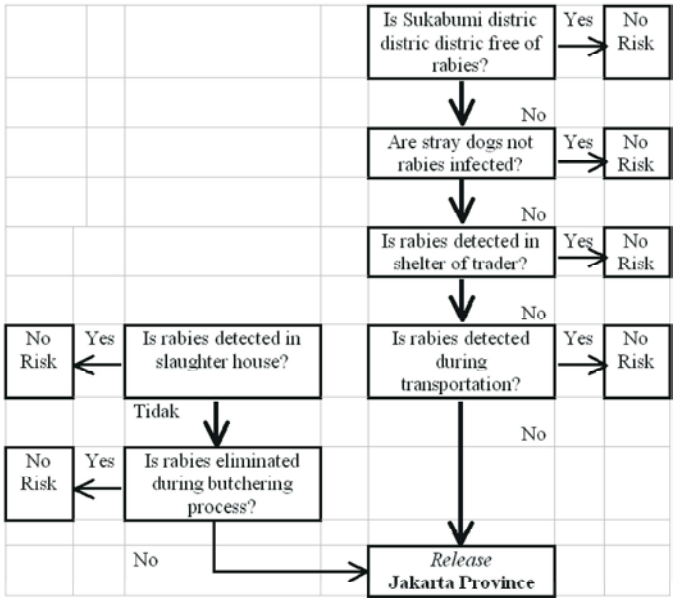


Fig. 2: Flow of rabies virus release from Distric of Sukabumi to Jakarta Province through the entrance of stray dogs as consumed dogs

The result of the release assessment of risk analysis on the introducing of rabies virus from Distric of Sukabumi to Jakarta Province through stray dogs were high with the low uncertainty, whereas through the dog meat were low with the low uncertainty. Release assessment results completely presented in Table 5.

Distric of Sukabumi was an endemic rabies areas, as the Decree of the Minister of Agriculture No. 3600/Kpts/PD.640/10/2009 [16]. Based on data from the Distric Livestock Services of Sukabumi, 2008 to August 2014, the number of cases of bites were reported 114 cases and biten victim were 192 people. Rabies cases in dogs occurred in 2008 were six cases which was in Cimanggu, Jampang Kulon, Jampang Tengah, Cidolog and Cikembar. Tthe last case was occurred in 2010 in Tegalbuleud. As Sukabumi distric was not rabies-free, it has a high probability to transmit rabies from Distric of Sukabumi to Jakarta Province.

Table 5: Summary of assessment of rabies virus release from Distric of Sukabumi to Jakarta Province through to the consumed of stray dogs

	Stray dogs of Sukabumi distric distric sent to Jakarta in the form	
Likelihood (Probability)	Life dog	Meat
Distric of Sukabumi was not free of rabies	High	high
Stray dogs were rabies infected	High	high
Rabies was not detected in shelters of traders	High	high
Rabies is not detected during transportation	High	high
Rabies is not detected at the slaughter houses	-	High
Rabies is not eliminated during the butchering process	-	Low
Result	High x High x High x High = High	High x High x High x High x High x Low = Low
Uncertainty	Low	Low

Based on report of The Distric Livestock Services of Sukabumi, in 2012 the population of dogs were 17 420 heads and 18.4% of them had been vaccinated against rabies. In 2013, the population of dogs were 14 480 heads and 13.8% of them had been vaccinated against rabies. Vaccination coverage in at least 70% of the dog population could prevent rabies in 96.5% of cases [17]. Considering the results of vaccination was below of the minimum vaccination coverage, then Distric of Sukabumi still has a high risk of rabies.

Some of the constraints faced by rabies prevention in Distric of Sukabumi were the vast area, dominated area by mountains, lack of human resources both in quantity and capabilities and lack of facilities and infrastructures such as the absence of the marker tool for animals that have been vaccinated with rabies and the cold chain was not well kept. According to Sarosa *et al.* [18], the vaccination in some areas were not in accordance with the correct procedures, such as the vaccine was not kept in refrigeration, so it would be able to affect the potency of vaccine.

Inaccurate data of the animal population target, lack of movement control and surveillance of animals transmitting rabies, lack of public awareness to report of bite cases and funding issues became other obstacles of this activities. An impact of the lack of funding was the uneven range of socialization against rabies in all regions of Sukabumi.

Although rabies vaccination was performed each year, it was only done in certain areas of the sub-district with a number of considerations such as, the capital region (Pelabuhan Ratu), the area that has a bite cases for the last two years (Nyalindung), area which borders of Banten (Cisolok) and the agribusiness area (Purabaya). Vaccination was focused on stray dogs and puppies. According to Putra [15], stray dogs had a higher probability to meet up with the other dogs/other animals transmitting rabies. Vaccination was done on puppies because these groups played a role in the spread of rabies with the an incidence rate of 17%.

Low vaccination coverage and unvaccinated stray dogs were the the potential major of rabies virus spread [19]. Based on the status of rabies vaccination and the many obstacles in the prevention of rabies in the District of Sukabumi, the movement of stray dogs from Distric Sukabumi to Jakarta Province had a high possibility of being rabies infected.

Post-vaccination monitoring was conducted every year by Distric Livestock Services of Sukabumi, Provincial Livestock and Animal Health Services of West Java and Disease Investigation Center (DIC) Subang by taking dog blood samples to to be examined by enzyme-linked immunoassay (ELISA) and dog brain samples by the fluorescent antbody test (FAT). The result of ELISA test monitoring in 2010, the imune protective antibody leve (l> 0.5 IU/ml) for blood samples from Middle Jampang was 12.3%. In 2011, blood samples were taken from Cikembar have protective levels of antibody immunity of 78.8%. In 2013, blood samples from Bantargadung, Cisolok, Kabandungan, Pelabuhan Ratu, Purabaya, Tegalbuleud and Warung Kiara, acquired immune protective antibody level of 12.4%.

FAT test results in 2010, two samples sent from Tegalbuleud, showed positive results, whereas in 2012, 20 samples sent from Cisolok, all showed negative results. Low levels of protective antibody immunity was partly because of the high dogs population, unvaccinated of stray dogs and recording system were unclear (data of vaccinated animal was not complete, so there was the possibility of animal blood sample taken was non-vaccinated animals). Other reasons were difficulty of catching of dog when officers came to vaccinate, especially dogs in rural areas and socio-economic conditions and the knowledge of the owner about rabies

relatively low [20]. According to Taiwo *et al*. [19] the low level of protective antibody immunity was one of the potential major of the rabies virus spread.

Based on the survey results, the stray dogs which were sent to Jakarta Province would be staying in a shelter of traders for 1-7 days. They put in one shelter, so if there was a dog which had just arrived, the dog was put together with the dogs which have stayed longer. Dogs bite cases have occurred in the shelter, because there was a quarrel between dogs. During in the shelter, dogs have never been vaccinated against rabies. According to experts opinion, of 100 (one hundred) dogs in the shelter, there were 10 heads (10%) likely to be bitten by other dogs.

Result of an assessment of traders knowledge about rabies was moderate, with an average value of 9:33; highest value was 12 and the lowest value was 7 (Default value: low = 0-<5; moderate = 5-10, high = 10-15). With regard to the results of DIC Subang, survey result and expert opinion, the possibility of undetected rabies in a shelter was possibility high.

Based on the survey results, the entrance of stray dogs as dogs consumption to slaughter house in Jakarta Province (Cililitan), Bekasi, Cibubur and Cibinong was illegal, because it was not accompanied by a Certificate of Animal Health from Distric Livestock Services Sukabumi, rabies vaccination certificate and recommendation letter from Provincial Livestock Services Jakarta Province. Aproximately 400 heads of dogs per month were sent from Distric of Sukabumi to slaughter houses in Cililitan, Cibubur and Cibinong. About 70% of them were sent to Cililitan. Experts assumed that 70% -80% of the dogs sent to Cililitan were stray dogs. According these estimation, the stray dogs moving into Jakarta Province as dogs consumption were about 200 heads/month.

The incubation period for rabies was quite long, varies from 5-6 days to several years, with the majority of cases 20-60 days [21]. With this condition, most likely the stray dogs from Distric of Sukabumi that seemed healthy were an agent of rabies. Taking into account of the results of the survey, the incubation period of rabies and expert opinion, the possibility of rabies which was not detected during transportation was high.

Approximately 30% of stray dogs from Sukabumi were sent to Bekasi, Cibubur and Cibinong to be slaughtered and sold to Jakarta in the form of meat. Surveys were not conducted in those three regions because of difficulties in finding the location. It was assumed slaughter house conditions in the regions with the same conditions in Jakarta Province. There were same treatment and conditions in the shelter of slaughter house and shelter of trader. Base on these condition, the author argued that the likehood of rabies which was not detected in the abattoir was high.

In the opinion of experts, headed dog carcass potentially carry the rabies virus before autolysis of the brain (approximately three days), whereas the role of the headless carcass of a dog can be ignored regarding the transmission of rabies. Mshelbwala *et al.* [22] stated, based on the detection of rabies antigen in dog's saliva and brain. Dogs were slaughtered for consumption which apparently healthy in Abia state, Nigeria were known that 5% of the total of 100 dogs were positive for rabies. Considering the sale of dog meat was headed and headless carcasses, then the potential for rabies which was not eliminated during the process of slaughtering was low.

Based on the release assessment, it was necessary to be considered, especially for the government to create a legal basis to regulate the trade of dogs and dog meat consumption. Considering the high demand for consumption dogs in Jakarta Province, then to reduce the risk of introducing rabies virus from Distric of Sukabumi was recommended only meat from the carcass of a headless dog that was allowed into Jakarta. According to Guadu *el al.* [23] one of the ways to increase public awareness about rabies, Ministry of Agriculture and Ministry of Health should work in cooperation with information sources like radio, television programs and newspapers to forward information related to rabies for enhancing the level of knowledge of the community about the deadly nature of the disease and the availability of preventive measures like vaccinations both for human and animals.

CONCLUTION

The result of the release assessment on the introducing of rabies virus from Distric of Sukabumi to Jakarta Province through stray dogs were high with the low uncertainty, whereas through the dog meats were low with the low uncertainty.

ACKNOWLEDGEMENTS

The authors thanks to Directorate General of Livestock and Animal Health Services for the scholarship. The authors also thanks to all staff of Animal Health Division of Provincial Marine and Agriculture Services Jakarta Province, staff of Animal Health Division of The Distric Livestock Services of Sukabumi and all participants who make this research accomplish.

REFERENCES

1. CFSPH, 2012. Rabies and rabies-related Lyssaviruses. www.cfsph.iastate.edu.
2. Admasu, P. and Y. Mekonnen, 2014. Rabies and its Folk Drugs Remedies in Ethiopia: A Review. International Journal of Basic and Applied Virology, 3: 22-27.
3. Wertheim, H.F.L., T.Q. Nguyen, K.A.T. Nguyen, M.D. Jong, W.R.J. Taylor, T.V. Le, H.H. Nguyen, H.T.H. Nguyen, J. Farrar, P. Horby and H.D. Nguyen, 2009. Furious rabies after an atypical exposure. PloS Medicine, 6: 1-5.
4. Muryanto, B., 2014. Dogs should be off the menu, say animal lovers. The Jakarta Post, Yogyakarta. May 09 2014.
5. Mau, F. and Y. Desato, 2012. Gambaran rabies dan upaya pengendalian di Kabupaten Ngada Provinsi Nusa Tenggara Timur (NTT). Buletin Penelitian Kesehatan, 40: 162-170.
6. Kuma, T., B. Deressa, F. Alem and W. Tigre, 2013. Farmer's Awareness and Practices on Rabies, Bovine Tuberculosis,Taeniasis, Hydatidosis and Brucellosis in Mana and Limmukosa Districts of Jimma Zone, South West Ethiopia. World Applied Sciences Journal, 23: 782-787.
7. Okonko, I.O., O.B. Adedeji, E.T. Babalola, E.A. Fajobi, A. Fowotade and O.G. Adewale, 2010. Why Is There Still Rabies in the World? - An Emerging Microbial and Global Health Threat. Global Veteriner, 4: 34-50.
8. Kabeta, T., W. Tigre and B. Deressa, 2014. Occurrence of Suspected Rabies Cases in Humans Jimma Zone and Surrounding Areas, South West Ethiopia. International Journal of Basic and Applied Virology, 3: 28-34.
9. Wandeler, A., 2004. Epidemiology and ecology of fox rabies in Europe. In: Historical Perspective of Rabies in Europe and the Mediterranean Basin. A.A. King, A.R. Fooks, M. Aubert and A.I. Wanderer (Eds.) Paris, OIE., pp: 201-214.
10. Soejoedono, R.R., 2004. Zoonosis Kausa Virus dan Riketsia. In: Zoonosis, Fakultas Kedokteran Hewan Institut Pertanian Bogor, pp: 129-135.
11. Weng, H.Y., P.I. Wu, P.C. Yang, Y.L. Tsai and C.C. Chang, 2009. A quantitative risk assessment model to evaluate effective border control measures for rabies prevention. Veterinary Research, 41: 1-11.
12. Biosecurity Australia, 2001. Guidelines for import risk analysis - draft. Department of Agriculture, Fisheries and Forestry. Canberra, Australia.
13. DAFF, 2008. Risk Analysis. Livestock disease management Volume 2. Sanitary and phytosanitary capacity building program. Canberra, Australia.
14. EFSA, 2006. Scientific statement on migratory birds and their possible role in the spread of highly pathogenic avian influenza. European Food Safety Authority EFSA-Q-2005-243.
15. Putra, A.A.G., 2011. Epidemiologi rabies di Bali, Analisis kasus rabies pada semi free-ranging dog dan signifikansinya dalam siklus penularan rabies dengan pendekatan ekosistem. Buletin Veteriner BBV Denpasar, 23: 45-55.
16. Ministry of Agriculture of Republic of Indonesia, 2009. Decree of Ministry of Agriculture No.: 3600/Kpts/PD.640/10/2009 about statement of rabies outbreak in Garut Distric, Tasikmalaya Disstric, Sukabumi Distric, Cianjur Distric dan Sukabumi Municipality, West Java Province and Lebak Distric, Banten Province.
17. WHO, 2005. WHO expert consultation on rabies 5-8 October 2004: first report. WHO Tech. Rep. Series 931, Geneva, Switzerland, pp: 1-121.
18. Sarosa, A., R.M.A. Adjid, G.S. Tjandra, T. Syafriati and E. Martindah, 1999. Penelitian epidemiologi penyakit hewan menular rabies di Sumatera. In: Laporan Balai Penelitian Veteriner Bogor pada Rapat Regional Rabies I se Sumatera Tahap II di Bukittinggi; 1999 Nov 23-24.
19. Taiwo, V.O., R.E. Antia, G.A. Adeniran, I.G. Adeyemi, O.O. Alaka and O.G. Ohore, 1998. Rabies in dogs and cats in southwestern Nigeria: Laboratory reports. Tropical Veterinarian, 16: 9-13.
20. Utami, S. and B. Sumiarto, 2012. Tingkat dan faktor risiko kekebalan protektif terhadap rabies pada anjing di Kota Makassar. Journal Veteriner, 13: 77-85.
21. Cahyono J.B.S.B., R.A. Lusi, Verawati, R. Sitorus, R.C.B. Utami and K. Dameria, 2010. Vaksinasi, Cara Ampuh Cegah Penyakit Infeksi. Kanisius, Yogyakarta.
22. Mshelbwala, P.P., A.B. Ogunkoya and B.V. Maikai, 2013. Detection of rabies antigen in the saliva and brains of apparently healthy dogs slaughtered for human consumption and its public health implications in Abia State, Nigeria. International Scholarly Research Notices Veterinary Science, pp: 1-5.
23. Guadu, T., A. Shite, M. Chanie, B. Bogale and T. Fentahun, 2014. Assessment of Knowledge, Attitude and Practices about Rabies and Associated Factors: In the Case of Bahir Dar Town. Global Veteriner, 13: 348-354.