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<Short communication>

Risk of rabies by importing animals to South Korea

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=ABSTRACT=

Rabies is one of the most dreadful diseases known to human. Annually, more than 55,000 human deaths occur throughout the world. The main transmitters are dogs. In South Korea, urban rabies is eliminated after massive national vaccine programme but rabies is still present in wildlife around northern part of the country near the border. Occasionally, rabies cases are still reported and there are spill over cases from racoon dogs. No human case was reported since 2005. Therefore, risk of rabies from exporting domestic dogs and cats from South Korea is very low. Hence, foreign rabies can be introduced by importing wild carnivores and unvaccinated dogs and cats under the age of three months since the South Korean legislation does not cover them. Therefore, it is essential to update current import regulation to minimise the risk of rabies.

Key words : Rabies, Wild Carnivores, Vaccination Programme, Importation Risk, Public Health

Introduction

Rabies is one of the most important and widespread zoonotic diseases, causing a fatal encephalomyelitis. The disease affects all mammalian including human. Rabies is a disease of poverty, affecting mainly children under the age of 15. Even though an effective rabies vaccine is available, rabies currently kills one person every 10 minutes, i.e. approximately 55,000 human deaths per annum. In Asia, more than 2.5 billion people are at potential risk of rabies infection; each year, an estimated 9 million people receive post-exposure rabies vaccination after being exposed to animals that are suspected of rabies (personal communication). The main route of rabies infection is through rabid dog bite (96~98% of human rabies cases).

The incubation period varies with the amount of the virus, strain and site of the inoculation. If the biting site is closer to the head, incubation period may be shorter than digital. The incubation period for dogs and cats were known as 10 days to 6 months, mostly the disease became apparent within 2 weeks to 3 months [12]. However, the incubation period is a few days to several years in human.

The early clinical signs of rabies are apprehension, restlessness, anorexia or an increased appetite, vomiting, a slight fever, dilation of the pupils, hyperreactivity to stimuli and excessive salivation. Ruminants may separate from the herd, becoming somnolent or depressed, and rumination may stop. Biting in ruminant is uncommon. The most reliable signs are behavioural changes and unexplained paralysis. In some cases in cats, no behavioural

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changes were notices, and the illness appeared to begin as ataxia or posterior weakness, followed by ascending paralysis. Horses and mules are often distressed and extremely agitated, which may be interpreted as colic. Recently, international movements for horses have been increased due to horse racing or horsemanship. One case of rabies was recorded in a horse imported to Finland from Estonia in 2003 [11]. Therefore, it is advisable to vaccinate horses when they are travelling rabies endemic countries. Laryngeal paralysis can cause a change in vocalizations, including an abnormal bellow in cattle or a hoarse howling in dogs. Wild animals often lose their fear of humans and may attack humans or animal species they would normally fear. Typically, affected animals die with progressive neurologic signs within 2~7 days of illness. Once clinical signs appear, the disease is fatal [7].

Rabies maintains two different epidemiological forms, one urban and another sylvatic. In the urban rabies form, dogs are the main reservoir host. The urban rabies is predominant in the areas where high proportion of unvaccinated and stray dogs existed. The urban rabies has been mostly eliminated in North America and Europe and remains as a neglected disease, although sporadic cases occur in dogs infected by wild animals [12]. On the other hand, the main transmitter of sylvatic rabies is different wildlife species such as fox and racoon dogs [3].

Most of the developed countries have eliminated urban rabies and rabies remains a neglected disease [1]. Current vaccines are highly efficient and applications for post exposure procedure are available to avoid fatalities.

History of Rabies in South Korea

In Korea, the disease has been known as 'mad-dog disease'. The term was used over centuries since the disease was recognised historically from mid Goryeo Dynasty [2]. Nearly a thousand years, Korean people used the term of 'mad-dog disease' for rabies. Therefore, most of the public concerns are focused on dog-mediated rabies.

In Korea, the first official written record of rabies was reported in dog in 1907 [5, 8]. Since then, Korea passed through the enzootic stage until year 1945 with an annual average of 500 cases. Between 1950 to 1984, rabies outbreaks were decreased significantly to an annual average of 30 cases as a consequence of national control programme for domestic dogs. Urban rabies was clearly eliminated from South Korea from 1985 to 1992. Unfortunately, rabies was again reported in 1993 in Gangwon Province, which is the northern part of South Korea near the border. In South Korea, dog-mediated rabies has mostly eliminated by massive national vaccination programme. For decades, the South Korean government implemented rabies vaccines to domestic dogs and cattle. The main transmitters of sylvatic rabies in South Korea are racoon dogs. Intermittently, spillover cases are reported from racoon dogs to domestic dogs and cattle in Gangwon Province. These incidents occur rather frequently during the winter (Jan~Feb), since racoon dogs wander around the rural area during the winter seeking for food [14].

Rabies Status in Domestic and Wildlife Animals

Out of total number of rabies cases notified to the OIE, one third was dog rabies (3,363/11,225) whereas the other one third was wild species (3,359/11,225) in 2010 (Fig. 1). According to the OIE, rabies cases were reported by 33 countries in 36 different wildlife species in 2010 [13]. Europe showed highest incident of rabies in wildlife. Red fox was the most frequently reported animals in European

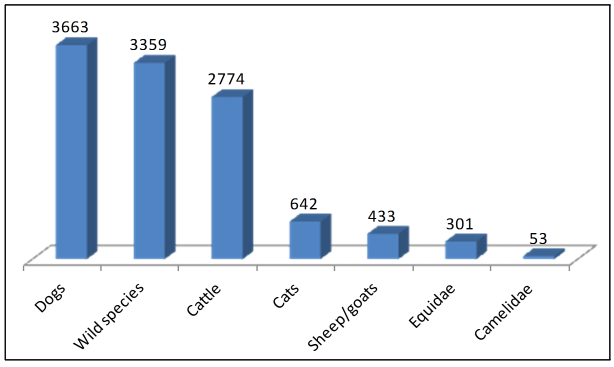

Fig. 1. Number of rabies cases notified to the OIE in 2010.

countries. In Africa, 47 cases were reported in wildlife. Rabies in wild animals was reported in 8 countries with 331 cases in the Americas in 2010 involving 10 different species. In Asia, 68 cases were reported in Israel, Mongolia and South Korea. However, this is not definitive data since not every country is notifying rabies cases to the OIE. Also, there is no accurate data and information on animal rabies in most of the developing countries. Furthermore, controlling stray dog population is not feasible due to those stray dogs became feral. Therefore, few problems were detected: underreporting in animal rabies cases, inconsistency of data collected, and lack of information. To eliminate rabies, control by vaccination in canine population is fundamental.

In South Korea, rabies eradication programme was continued to dogs and cattle with live and killed vaccine of 1.4 million doses since 1995 [9], and the oral vaccination of racoon dogs with annual vaccinia-rabies glycoprotein (V- RG) bait vaccine of over 0.2 million doses since 2002 [5]. Annual oral vaccination campaign for wild animals has been conducted twice a year covering northern part of the country.

Current Legislation of South Korea

Recently, South Korean Veterinary authority amended the regulations for the companion animals (dogs and cats) travelling from foreign countries. The new legislation will be active from December 2012. Currently, pet animals can introduced to the country with the certificate of valid rabies vaccination, but importation allowed without vaccination when animals are under the age of three months. In addition, there is no regulation for other carnivores which can be a potential source of rabies transmission. Apart from dogs and cats, wild carnivores can be introduced into the country without test for rabies since they are not listed as industrial animals under the Health Requirements. If wild carnivore travels into the country, Veterinary authority observes the animals for 5 days at the quarantine station checking up for health status. Therefore, it is necessary to include wild carnivores into rabies concern.

During last 5 years, average of 7 thousand of imported or exported cases of dogs and cats were reported to/from South Korea (Table 1). During this time, wild carnivores were also introduced into the country, such as racoon dogs, foxes and ferrets (Table 2). So far, there is no record of imported rabies case in South Korea. Under the regulation of the EC, pet animals include ferrets [4]. Nowadays, ferrets can be included as domestic carnivores since there is increased need of trading ferrets as a pet. Over a thousand

Table 1. Number of imported/exported dogs and cats to/from South Korea between 2007 to 2011 November

	Import		Export	
	Dogs	Cats	Dogs	Cats
2007	5,203* (12,650†)	1,043 (1,641)	5,832 (9,994)	670 (818)
2008	4,959 (10,190)	1,160 (2,117)	5,705 (8,559)	788 (920)
2009	4,754 (8,465)	1,160 (2,129)	5,855 (7,413)	862 (983)
2010	5,587 (11,222)	1,386 (2,431)	6,259 (7,710)	955 (1,101)
2011	6,565 (14,101)	1,235 (1,982)	6,410 (7,934)	1,027 (1,214)

* Number of cases, † number of heads.

Table 2. Number of import wild carnivores to South Korea between 2007 to 2011 November

	Import		
	Racoon dogs	Fox	Ferret
2007	1 (20)*	8 (29)	19 (585)
2008	− (−)	5 (48)	35 (1,024)
2009	4 (21)	10 (137)	32 (1,196)
2010	− (−)	6 (66)	35 (1,494)
2011	2 (7)	3 (41)	25 (1,323)

* Number of cases (number of heads).

heads of ferrets were imported annually; however, rabies was avoided by Veterinary authority as well as by importers.

Under the EC Regulations for pet animal movement [4], animals under the age of three months and unvaccinated from rabies endemic country should be accompanied by their mother with full veterinary certificate with appropriate rabies vaccination as well as a neutralising antibody titration at least equal to 0.5 IU/㎖. Current legislation of South Korea does not cover the animals under three months of age. Puppies are attractive but could possess rabies risk if the animals are from rabies endemic countries. Also, there are number of rabies cases were reported through illegal or accidental import of infected animals into United States [10] and into Europe [6].

Therefore, it is critical to amend details of Health Requirements for wild carnivores as well as for unvaccinated dogs less than three months of age from rabies endemic countries.

Concluding Remarks

As mentioned earlier, rabies in Korean term is 'mad-dog disease'. Therefore, public awareness of the disease is limited to dog only. Not many people are aware of that the disease can be transmitted by rabid wild animal bite other than rabid dog bite. When people are going for hiking, some people are trying to catch or touch racoon dogs without knowledge of rabies. Therefore, it is very important to educate general public and to campaign hikers that all carnivores can transmit rabies and possess risk of rabies including wildlife, such as racoon dogs, especially northern part of the country, near the border. As a part of this campaign, Korean Centre for Disease Control (KCDC) is trying to change the name of the disease from 'mad-dog disease' to 'hydrophobia' to raise the public concerns not only to dogs but all mammals. Even though rabies cases are still reported and there are spill over cases from racoon dogs. No human case was reported since 2005.

Urban rabies has been eliminated after massive national vaccine programme but sylvatic rabies is still present in wildlife around the northern part of the country near the border, especially in Ganwon Province. Even though Korean government has been continuously tried to eliminate sylvatic rabies by annual oral vaccination and if it succeed, the risk of re-introduction of the disease still exist. Re-introduction of rabies can break out through illegal or accidental importation of an infected animal as well as through the border between North and South Korea, demilitarised zone (DMZ) in particular. So far, no imported case of rabies was reported in South Korea. Still the danger of disease is present and foreign rabies can be introduced by importation. Therefore, the Veterinary authority should also take action to amend the Health Requirements for rabies, so wild animals and unvaccinated dogs under age of three months should be included to minimise the risk of rabies.

Rabies is dreadful but neglected, yet controllable disease. The control measures should be constantly reviewed and modified to eliminate the disease from the country as well as to prevent re-introduction into the country.

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References

1. **Banyard AC, Hartley M, Fooks AR.** Reassessing the risk from rabies: a continuing threat to the UK? Virus Res 2010, **152**, 79-84.
2. **Chang I, Kim N**. Rabies and hydrophobia. J Kor Med Assoc 1961, **4**, 36-42.
3. **de Mattos CA, de Mattos CC, Smith JS, Miller ET, Papo S, Utrera A, Osburn BI.** Genetic characterization of rabies field isolates from Venezuela. J Clin Microbiol 1996, **34**, 1553-1558.

4. **EC Regulation 998/2003**. On animal health requirements applicable to the non-commercial movement of pet animals and amending Council Directive 92/65/EEC.
5. **Hyun BH, Lee KK, Kim IJ, Lee KW, Park HJ, Lee OS, An SH, Lee JB.** Molecular epidemiology of rabies virus isolates from South Korea. Virus Res 2005, **114**, 113-125.
6. **Johnson N, Freuling C, Horton D, Muller T, Fooks AR.** Imported rabies, European Union and Switzerland, 2001-2010. Emerg Infect Dis 2011, **17**, 753-754.
7. **Kahn C**. Rabies. In: the Merck veterinary manual, p. 2945, 10th ed. Merck and Co, Inc. New Jersey, 2010.
8. **Kim CH, Lee CG, Yoon HC, Nam HM, Park CK, Lee JC, Kang MI, Wee SH.** Rabies, an emerging disease in Korea. J Vet Med B Infect Dis Vet Public Health 2006, **53**, 111-115.
9. **Lee JH, Lee MJ, Lee JB, Kim JS, Bae CS, Lee WC.** Review of canine rabies prevalence under two different vaccination programmes in Korea. Vet Rec 2001, **148**, 511-512.
10. **McQuiston JH, Wilson T, Harris S, Bacon RM, Shapiro S, Trevino I, Sinclair J, Galland G, Marano N.** Importation of dogs into the United States: risks from rabies and other zoonotic diseases. Zoonoses Public Health 2008, **55**, 421-426.
11. **Metlin AE, Holopainen R, Tuura S, Ek-Kommonen C, Huovilainen A**. Imported case of equine rabies in Finland: Clinical course of the disease and the antigenic and genetic characterization of the virus. J Equi Vet Sci 2006, **26**, 584-587.
12. **OIE**. Rabies. OIE rabies portal, technical disease card, 2009.
13. **OIE**. Report of the animal disease status. 79th General Session of the OIE, 2011.
14. **Yang DK, Kim SY, Oh YI, Lee JA, Cho SD, Lee KW, Song JY**. Epidemiological characteristics of rabies in South Korea from January 2004 to March 2011. J Bacteriol Virol 2011, **41**, 165-171.