Rabies Immune Status of Dogs Brought into the Hyogo Prefecture Animal Well-Being Center, Japan

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ABSTRACT. Stray dogs are a public health risk factor when canine rabies is endemic. The Rabies Prevention Law has introduced measures to control stray dogs, but many dogs are still captured in Japan. In order to estimate the immune status of stray dogs for the purposes of risk management, we conducted a serological survey at the Hyogo Prefecture Animal Well-being Center. Only 27.7% of dogs brought into the Center (n=166) had protective immune status. This result suggests that there is the potential for reintroduction of canine rabies into stray dogs, leading to endemic rabies and its transmission to humans. Continued removal of stray dogs, education on rabies prevention and vaccination of dogs therefore remain important public health issues.

KEY WORDS: Hyogo, immune status, Japan, rabies, stray dog.

Rabies is a severe zoonotic viral disease that causes fatal encephalitis. Human mortality from rabies is estimated to be 55,000 deaths per year worldwide, and more than 90% of human deaths due to rabies are caused by rabid dogs [3, 12]. Endemic canine rabies can be transmitted to humans and other species [11], and when rabies outbreaks occur in dogs, necessary public health measures include chaining or caging dogs, performance of diagnostic tests for rabies, temporary immunization and restricting the movement of dogs. Stray dogs, however, pose a high risk to humans because they are not supervised by their owners. In Japan, stray dogs have been captured under the Rabies Prevention Law, the Humane Treatment and Management of Animals Law and other laws [1], and although the number of captured dogs has decreased each year, more than 80,000 dogs were captured in 2006 (http://www.mhlw.go.jp/bunya/kenkou/kekkaku-kansenshou10/02.html). In addition, the seroprevalence of these captured dogs has not been well documented as yet, even though canine herd immunity is one of the important factors that influence endemic rabies. We therefore estimated seroprevalence against rabies in dogs brought into the Hyogo Prefecture Animal Well-being Center, including stray dogs, for the purposes of risk management.

Serum samples were collected from dogs (n=166) in the Center from 2006 to 2007. Of these, 106 serum samples were from so-called "stray dogs", which were captured and brought into the Center by rabies prevention officers or others, or dogs that were brought into the Center by their owners in 2006. The remaining 60 serum samples were from dogs captured and brought into the Center by rabies prevention officers or others in 2007. The neutralizing antibody titers for rabies were measured using the indirect immunoperoxidase virus neutralizing test [5]. In brief, a cell suspension of Neuro-2a (ATCC CCL-131) was prepared in 96-well plates. Then, serial threefold dilutions of serum samples were mixed and incubated with an equal volume of the rabies virus CVS strain. Following incubation, the mixtures were added to each well, and the microplates were incubated for 4 days. After incubation, the wells were fixed with acetone and stained by the indirect immunoperoxidase technique. The antibody titers were calculated by comparison with the titer of the 0.5 IU/ml OIE anti-rabies canine reference serum. Antibody titers above the 0.5 IU/ml threshold were considered to be protective [10]. The seropositive rate was calculated as the percentage of dogs demonstrating protective immune status (≥0.5 IU/ml). Statistical analysis was performed using the Chi-square test (p<0.05).

The seropositive rate of dogs (n=166) in this study was 27.7% (Table 1). The rates in 2006 (n=106) and 2007 (n=60) were 30.2% and 23.3%, respectively. The dogs were grouped by breed and sex into purebred dogs (n=33), crossbred dogs (n=133), females (n=82) and males (n=84), and the seropositive rates were 24.2%, 28.6%, 22.0% and 33.3%, respectively. There were no significant differences between the groups (p<0.05).

In the present study, the seroprevalence of stray and other dogs brought into the Hyogo Prefecture Animal Well-being Center was reported for the first time, although the seroprevalence of Japanese dogs has previously been estimated based on the annual vaccination coverage of registered dogs (http://www.mhlw.go.jp/bunya/kenkou/kekkaku-kansenshou10/02.html) and by several serological surveys conducted at animal hospitals in some regions or by animal quarantine [7, 8, 13]. In this study, the incidence of protective immune status in dogs brought into the Center (n=166) was very low (27.7%), although the vaccination coverage of
A recent study in Japan found that as few as 23.3% of stray dogs were seropositive for rabies, indicating a low level of protective immunity. This is concerning as rabies can be reintroduced into the human population, with potential severe consequences.

In this study, the seropositive rate was 27.7% in 2007, a significant decrease from 30.2% in 2006, indicating a need for continued rabies prevention efforts. The results suggest that most owners who gave up dog breeding were less likely to vaccinate their dogs at regular intervals, regardless of breed or sex.

Control programs for rabies have been enforced since 1950 in Japan, but the risk of rabies reintroduction into dogs in Japan cannot be ruled out. There have been some recent reported cases of rabid animals imported illegally into France and Belgium, highlighting the importance of continued vigilance.

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REFERENCES