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学位論文題名
The title of the doctoral dissertation

Seroepidemiological study of anthrax among cattle in Zambia

ザンビアにおけるウシの炭疽に関する血清疫学研究

Bacillus anthracis is the etiological agent of anthrax, a zoonotic disease that is endemic in the Western Province of Zambia. Anthrax outbreaks among cattle in the Western Province are reported on nearly an annual basis and cause significant economic losses because the majority of the rural population is dependent on livestock for their livelihood. Despite the persistence and frequency of cattle anthrax outbreaks, the present seroepidemiologic situation and its contribution to anthrax outbreak recurrence remains poorly understood. Surveillance of cattle anthrax is crucial for determining the impact, high risk areas and the effectiveness of intervention measures. In Zambia, serological tools and seroepidemiological data are necessary to complement the current retrospective anthrax targeted surveillance system.

In Chapter I, an indirect enzyme-linked immunosorbent assay (ELISA) based on *B. anthracis* recombinant protective antigen domain 1 (rPA-D1) was developed. The study demonstrated the utility of a domain of protective antigen (PA). In addition to the assay specificity and precision, stability of lyophilized rPA-D1 antigen when stored at room temperature is an added asset that will be useful in resource-limited settings. The rPA-D1 ELISA was able to detect seroconversion in cattle following anthrax vaccination.

In Chapter II, the usefulness of the rPA-D1 ELISA was demonstrated. For the first

time, in a cross sectional study conducted in the Western Province of Zambia, serum samples collected from eight herds of Barotse cattle were screened for anti-PA antibodies using the rPA-D1 ELISA. Analysis of the association between antibodies and vaccination timing showed significant differences in the level of the detectable antibodies over time, suggesting that the rPA-D1 ELISA is a useful tool for anthrax surveillance and for the detection of anti-PA antibodies in cattle in Zambia. The study also provides essential epidemiological information on herd health and anthrax vaccination practices in the Western Province of Zambia.

In Chapter III, to understand the current seroepidemiological situation in anthrax outbreak areas, the incidence, geographic distribution of cattle anthrax outbreaks and the seroprevalence of anti-PA antibodies in 1619 Barotse cattle was assessed. The study indicated that, although the number of reported anthrax cases was decreasing, there was a change in the distribution of outbreaks, suggesting that anthrax outbreaks were no longer limited to the Barotse Floodplain. The study detected a low seropositive rate of anti-PA antibodies among the cattle sampled indicating that in addition to other epidemiological factors, inadequate cattle anthrax vaccination may be a contributing factor to anthrax outbreak recurrence.

These findings have important implications on the epidemiology of cattle anthrax and also point out areas in disease control that may require prioritization for delivery of veterinary services. Other findings add substantially to our understanding and knowledge of anthrax serology among Barotse cattle in the Western Province of Zambia.