COMPARATIVE EFFICACY OF DIFFERENT
IMMUNIZATION SYSTEMS AGAINST ANAPLASMOSIS

H. ZARAZA* and K. L. KUTTLER†

SUMMARY

Animal response to anaplasmosis vaccination was measured using an attenuated organism, a killed adjuvant vaccine, and a virulent Anaplasma marginale. A total of 7 calves (2–4 months of age) and 5 heifers (18 months of age) received the attenuated organism; 8 calves were given the adjuvant vaccine; 7 calves were premunized with virulent A. marginale; and 7 calves remained as non-vaccinated controls. The animals were vaccinated at Tibaitata on the Bogota Savannah, and later moved to the north coast of Colombia, an anaplasmosis enzootic area.

All vaccination methods produced positive CF results. The live agents resulted in low parasitaemias in most instances, although the attenuated organism was particularly mild in the younger animals.

Protection from field challenge was observed in all calves premunized with virulent organism, and in two of five heifers premunized with the attenuated organism. All other vaccinated animals developed anaplasmosis which was equally as severe as seen in the non-vaccinated controls.

INTRODUCTION

Previous studies, as well as personal communication with veterinary clinicians confirm the presence of large anaplasmosis enzootic areas in Colombia. A preliminary survey (Kuttler, Adams & Zaraza, 1969) suggested that ranching areas less than 1,524 m elevation should generally be classified as anaplasmosis enzootic zones. Anaplasmosis is recognized as a serious clinical problem among previously clean cattle introduced into these areas. The extent of losses in native cattle is not fully known but is probably significant.

Mott & Gates (1948) showed that some resistance to anaplasmosis was produced by antigens obtained from whole blood infected with Anaplasma marginale. Kuttler (1961) described a significant degree of protection using oil adjuvants with similar antigens. Brock (1965) described a similar vaccine which when given in two inoculations spaced at 4 to 6 week intervals gave sufficient protection to warrant commercial production.

Ristic, Sibinovic & Welter (1968) and Welter & Woods (1968) described an attenuated Anaplasma which would produce a mild reaction in susceptible animals, rendering them immune to future A. marginale exposure. This vaccine is somewhat similar to premunization work done by Schmidt (1947) except that an attenuated organism is used to replace the virulent A. marginale.

This study compares the safety and efficacy of these immunologic approaches

* Present address: Laboratorio Investigaciones Medicas (Veterinarias), Bogota, Colombia. Apartado Aereo 7984.
† Institute of Tropical Veterinary Medicine, Texas A. & M. University, College Station, Texas.
when animals are vaccinated on the Bogota Savannah (altitude 2,600 m) and later moved to Turipana on the north coast of Colombia (altitude 13 m), an anaplasmosis enzootic area.

MATERIALS AND METHODS

A total of 29 Holstein Friesian calves, 2–4 months of age were divided into four groups. An additional group of five 18 month old Holstein Friesian heifers were used. Group I consisted of 7 calves. On day 0 they were injected subcutaneously with 5 ml of attenuated \textit{A. marginale} vaccine*. Group I-A, consisting of five 18 month old heifers, were injected subcutaneously on day 0 with 5 ml of the attenuated \textit{A. marginale} vaccine.

Group II consisted of 8 calves. On day 0 and 28 they were injected with 2 ml of the reconstituted adjuvant vaccine. Group III consisted of 7 calves. On day 0 they were injected with 2 ml whole blood from a splenectomized calf carrying a fully virulent \textit{A. marginale} infection. The donor calf while having fewer than 0.1 per cent parasitized cells was showing a 1:40 anaplasmosis complement-fixation titre. The 7 calves of Group IV remained as non-vaccinated controls.

All animals were bled twice weekly from day 0, date of vaccination, until day 74 when they were transported by air to Turipana. During this time packed cell volume (PCV) determination, anaplasmosis complement-fixation (CF) tests, and Giemsa-stained blood smears were examined, to monitor animal response to the immunologic procedures performed.

The same observations were made twice weekly following arrival at Turipana for the next 150 days. One animal died of undetermined causes at Bogota and several others of babesiosis following arrival at Turipana. Observations at Turipana were therefore limited to 5 calves in Group I, 5 in I-A, 5 in II, 4 in III, and 6 in IV.

The CF test was performed using the basic technique described by the USDA (1958) with serum titre determined by a micro technique similar to that described by Hidalgo & Dimopoulos (1967). An analysis of variance, was performed to determine significant differences. A logarithmic transformation was made of the serum dilution factors for statistical analysis.

RESULTS

Animal response to vaccination is tabulated and compared to non-vaccinated controls in Table I. Prior to vaccination PCV values were essentially the same for all groups. Among Group I only 5 of 7 calves responded with evidence of \textit{Anaplasma} infection. All animals of Groups I-A and III showed evidence of infection as anticipated. The incubation time in those animals receiving and responding to the live vaccines was 45 days in Group I, 28 days in Group I-A, and 20 days in Group III. The 45 day incubation seen in Group I was significantly greater than the others. The average low PCV occurring during a 74 day period following vaccination was significantly lower in Group III. A marked CF response was observed in all animals in the vaccinated groups with the exception of 2 calves in Group I. Group I (five calves) had an average maximum titre of 1:61, I-A 1:970, II 1:110, and III 1:177. The CF titre occurring in Group I-A was significantly higher than seen in Groups I, II and III, although no other significant differences were detected. Parasitaemias, however, were generally very low in all groups. Group I showed an average maximum parasitaemia of only 0.32 per cent among the five animals responding to the attenuated organism.

* An attenuated \textit{A. marginale} vaccine—Diamond Laboratories, Des Moines, Iowa. The vaccine was hand-carried in dry ice from Mexico City and used the day of arrival in Bogota.

† “Anaplaz”—Fort Dodge Laboratories, Ft. Dodge, Iowa.