Scand. J. Lab. Anim. Sci. No. 1. 1996. Vol. 23

Serum antibody response to canine distemper virus vaccines in beagle dogs

by *Ulla Rikula, Liisa Sihvonen[1], Hanna-Marja Voipio[2] & *Timo Nevalainen[2]*
Ministry of Agriculture and Forestry, Veterinary and Food Department, [1]National Veterinary and Food Research Institute, Helsinki
and [2]National Laboratory Animal Center, University of Kuopio, Kuopio, Finland.

Introduction

Immunogenicity of live viral vaccines depends on the virus strain (antigen) used, its attenuation, passage level and method of production. The modified live canine distemper virus vaccines available are either of egg and avian origin or canine cell culture adaptations (*Appel* 1987). The objective of this study was to determine how serum neutralizing antibodies were produced in beagle dogs after vaccination.

Materials and Methods

Three groups of 25 purpose bred beagle dogs (altogether 15 litters) were vaccinated with one of the three commercial triple vaccines (live distemper virus + killed/live adeno virus + killed parvo virus) at the age of 3 and 4 months. The distemper (CDV) part of the vaccines differed. Vaccine 1 has Rockborn strain produced in canine cells, vaccine 2 has Onderstepoort strain produced in chicken embryos and vaccine 3 has Onderstepoort strain produced in Vero cells. Blood samples were drawn from all 75 dogs at the age of 3, 4 and 5 months and from 8 dogs in vaccine 1 group and 6 dogs in vaccine 2 and 3 groups at the age of 1 year. Serum neutralizing antibodies to CDV were measured in Vero cells using 100 $TCID_{50}$/ml of Onderstepoort strain of CDV as the antigen (*Appel & Robson* 1973). Inactivated sera were diluted fourfold (1/8, 1/32, 1/128 and 1/512). Kruskal-Wallis one-way nonparametric AOV was

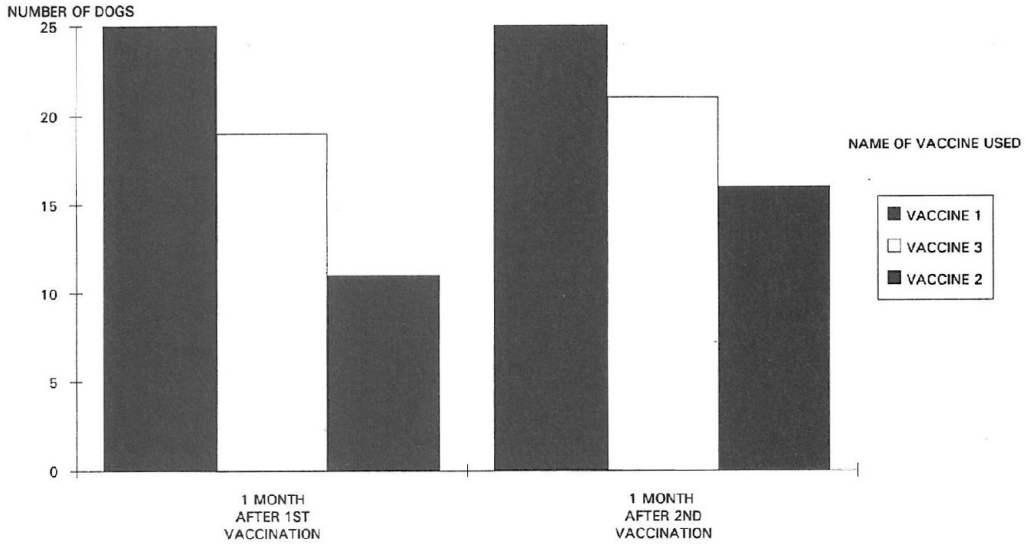

Figure 1. Number of dogs with neutralizing antibodies (≥1/8) in 3 groups of 25 beagle dogs vaccinated at the age of 3 and 4 months

used to compare the non-normally distributed antibody levels and Yates corrected Chi-Square to compare the number of dogs with titer ≥1/8 and <1/8 after vaccination with different vaccines.

Results and Discussion

No maternal antibodies were detected at the time of first vaccination. One month after the first vaccination 73% (55/75) of puppies and one month after the second vaccination 83% (62/75) of puppies had produced distemper neutralizing antibody titer ≥1/8 (Figure 1). 75% (15/20) of dogs tested at the age of one year had antibody titer ≥1/8. All the 25 dogs in vaccine 1 group had titer of ≥1/32 while 11 dogs in vaccine 2 group and 19 dogs in vaccine 3 group had titer of ≥1/8 one month after first vaccination. 16 dogs in vaccine 2 group and 21 dogs in vaccine 3 group had titer of ≥1/8 one month after second vaccination. Neutralizing CDV antibody titers in vaccinated dogs are shown in Figure 2. All the 8 dogs in vaccine 1 group had a titer of ≥1/32, 3/6 dogs in vaccine 2 group and 4/6 dogs in vaccine 3 group had a titer of ≥1/8 at the age of one year.

Humoral immunity is an important part of resistance to canine distemper. Protection against distemper may also relate to immune interference, interferon and cell-mediated immune mechanisms (*Greene & Appel* 1990). Outcome of challenge with virulent CDV is more reliable than neutralizing antibody titer in individual dog for measuring the immunity. Neutralizing antibodies reflect well the immune status of the population. This study revealed differences in antibody responses between the three commercial distemper vaccines. Rockborn strain (vaccine 1) produced in canine cells induced on average the highest titers, and smallest variance of serum neutralizing antibodies between vaccine groups (Figure 2). There was a statistically significant difference between vaccine 1 and 2 (p=0.0001 and p=0.0001) and vaccine 1 and 3 (p=0.0038 and p=0.0007) in the levels of antibody both one month after the first vaccination and one month after the second vaccination. There was also a significant difference (p=0.0433) between the 2 Onderstepoort strains (vaccine 2 and 3) inducing CDV antibodies (titer ≥1/8 or <1/8) in dogs one month after first vaccination indicating difference in antigenicity between the vaccines.

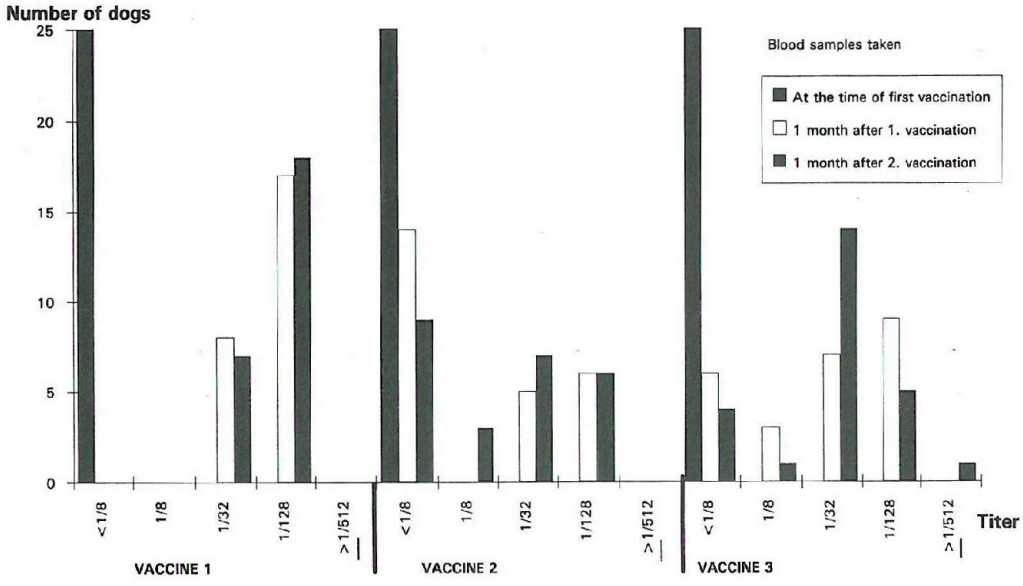

Figure 2. Neutralizing CDV antibody titers (<1/8, 1/8, 1/32, 1/128, ≥1/512) in vaccinated beagle dogs at different times

Summary

The three commercial triple CDV vaccines used for vaccination differ by the virus strain and the method of production. The immunogenicity of these vaccines was studied in beagle dogs under experimental conditions using neutralizing antibody titers as the measure.

Differences in antibody responses were detected between the three distemper vaccines. Rockborn strain produced in canine cells (vaccine 1) induced on average the highest titers and smallest variance of serum neutralizing antibodies between vaccine groups. There was also a significant difference between the 2 Onderstepoort strains (vaccine 2 and 3) inducing CDV antibodies in dogs one month after first vaccination indicating difference in antigenicity between the vaccines.

References

Appel M & DS Robson: A microneutralization test for canine distemper virus. Am. J. Vet. Res. 1973, *34*, 1459-1463.

Appel M: Distemper Virus.In Appel M (ed): Virus Infections of Carnivores. Elsevier Science Publisher, 1987 pp. 133-159.

Greene CE & M Appel: Canine Distemper. In Greene CE (ed): Infectious Diseases of the Dog and Cat. WB Saunder Co. 1990 pp. 226-241.