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RESEARCH ARTICLE

Immune Response of Camel (Camelusdromedarius) to Clostridial Vaccine

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Abstract

The objective of this study wasto evaluate the immune response of camel to polyvalent clostridial vaccine .A total of 25 camel were assigned into 3 groups (Group A (n = 15) , Group B (n = 5) and group C (n = 5). All animals received 2 doses with 4 weeks intervals; animals in group B received a booster dose one month before permutation. Of the 25 animals, 9 (36 %) animals developed injection-site lesions on day 28 post vaccination. Animals in group A showed a satisfactory immune response to clostridial vaccine, the mean antibody titer in day 180 post vaccination was 34.80±9.27, 0.84±0.47, 0.83±0.76, 15.00±4.17 and 0.63±0.38 for Cl. Chauvoei , Cl. septicum, Cl. novyi, Cl. perfringens C and Cl. perfringens D respectively . Vaccination of pregnant dams one month before parturition induced a high antibody in serum and colostrum at the day of parturition. Maternal immunity passively protected the off springs during the critical period. The mean antibody titer in newly born camel calves in the day 60 post parturition was 10±1.41, 0.3±0.27, 0.8±0.27, 8.4±1.67 and 52±0.31 for Cl. Chauvoei , Cl. septicum, Cl. novyi, Cl. perfringens C and Cl. perfringens D respectively. In conclusion, immunization of camel with 2 doses of alum precipitated polyvalent clostridial vaccine can protect the them from clostridial diseases. booster dose one month before parturition provide a passive maternal immunity for the newly born calves in the age of susceptibility to clostidial diseases .It is recommended to optimize the husbandry conditions of the calves and ensure that newly born calves suck the colostrum within 12 hours after birth.

Introduction

Camels are the most capable animal species in utilizing marginal areas and in survival and production under harsh environmental conditions (Knoess, 1977; Abbas and Tilley, 1990; Schwartz, 1992). Although camels were considered in the past, and for a fairly long time, as resistant to many disease causing factors (Zaki, 1948), it has been proved that camels are susceptible, the same as other livestock or even more, to the common disease causing pathogens affecting other animal species (Abbas and Tilley, 1990; Saint-Martin et al., 1992; Abbas and Agab, 2002).

Camels are slow reproducers. A female camel is sexually mature at the age of 4-5 years. Pregnancy is just over 12 months and the calving interval in pastoral production systems is normally 24 months or more. Beside this natural productivity limitation, the main factor affecting herd growth is calf mortality, which is high during the postnatal and pre-weaning stages. In a survey carried out in eastern Sudan,(Agab and Abbas (1998)reported a 48% mortality rate among calves under 6 months of age and 14.6% after that time.

Clostridia are of major importance in farm animals as primary causes of disease. They are all potent producer of exotoxins up on which their pathogenicity depended (Songer, 1996). The

ubiquitous nature of this bacteria makes eradication of clostridal diseases virtually impossible and necessitates control by prophylactic measures.
Clostridium perfringens enterotoxaemia is an important cause of camel calve mortalities (El-Sanousi and Gameel, 1993).
Prevention of clostridial diseases with vaccines has been practiced for many years in cattle, sheep and goats (Jansen, 1967; Blackwell et al., 1983; Stokka et al., 1994). Most of the vaccines for clostridial diseases in cattle are bacterins incorporating several species of Clostridium into a single vaccine.
The current work was planned to as a Preliminary study for evaluation the immune response of camel to polyvalent clostridial vaccine.

Material and Methods

1- Animals :
A total of 25 Camel (Camelusdromedarius) aged between 5 – 10 years were assigned into three groups ; Group A (n = 15) , Group B (n = 5) and group C (n = 5). All animals had no previous history of vaccination against clostridial diseases. Animals in group B and C were pregnant she camel.

2- Vaccine schedule :
Polyvalent commercial alum precipitated clostridial vaccine containing antigens and toxoids from Cl. Chauvoei,Cl. septicum , Cl. novyi type B , Cl. tetani and Cl. perfringens type C and D was used in this study . The vaccine is labeled for 5 ml injection with revaccination in 4 – 6 weeks. The vaccine was injected subcutaneously over the shoulder using an aseptic technique.
Animals in all groups received 2 doses of vaccine, the first dose at day 0 and second dose was at day 30. Group B received a booster dose one month before parturition.
Blood was collected from all animals via jugular vein puncture at different time intervals (day 0 (before first vaccination) , day 30 before second vaccination , day 60 , day 90 , day 120 , day 150 and day 180 .
Blood samples and colostrum were collected from all animals in group B and C before nursing occurred. All calves were bled before nursing, at 24-36 hours post-nursing, at one week of age and at monthly intervals thereafter up to 180 days post-partum.

3- plate agglutination test for measuring Agglutination titers of Cl. Chauvoei :
Antigen preparation and titer calculation was performed according to Claus and Macheak (1972)and modification of Troxel et al., (1997).

4- Toxin neutralization test :

Antitoxin units were determined for Cl. Perfringenstype C ,Cl. Perfringens D , Cl. novyi, and Cl. septicum by the antitoxin neutralizationtest as described by USDA:APHIS:VS (1985), USDA:APHIS:VS (1993), UDSA (1999) and British Pharmacopoeia, (2010)respectively .

Result

1- Animals in group A (n = 15):
As shown in Table (1)**,** on day 0 and before the first dose of vaccination all animals showed no detectable antibodies to the component of the used polyvalent vaccine.
The mean agglutinating antibody titer against Cl. chauvoei was 10.87 ± 2.72 on day 30 and before the second dose of vaccine. After second dose and on day 60 the mean titer increased to be 40.27 ± 7.13 and reach to its peak on days 90 to be 84.20± 6.61. Antibodies against Cl. chauvoei still detectable up to the day 180 post vaccination.
Concerning to mean antitoxins against Cl. septicum, Cl. novyi, Cl. perfringens C and Cl. perfringens D, all vaccinated animals showed no detectable antitoxins before vaccination. On day 30 the mean antitoxins were 1.12 ± 0.49, 1.01 ± 0.62,6.13 ± 2.39 and 1.10 ± 0.55 respectively. All animals still had a detectable antitoxin titer up to the day 180 post vaccination.

2- Animals in Group B (n = 5) and Group C (n = 5) :
Table (2) showed the antibodies in serum and colostrum of animals in group B and C. Animals in group B showed a high serum and colostrum antibodies against Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. perfringens C and Cl. perfringens D where it was 138±16.43, 9.2±1.30,6.2±1.78, 42±13.50 and 14.6±4.56 in serum and 115±11.18,6.4±1.14, 5±1.41, 37±8.36 and 11.6±3.04 respectively . In contrast animals in group C showed a low titer in both serum and colostrum.

3- Newly born camel calves:
Serum samples collected from newly born camel calves before ingestion of colostrum showed no detectable antibodies in both groups B and C.
As illustrated in Table (3) , 24-36 hours after ingestion of colostrum, animals showed detectable antibodies in their serum which still detectable up to 60 days. On day 60 all animals received a first dose of polyvalent vaccine. on day 90 , the antibody titer start to increased and reach its peak on the day 150 where it was 51±9.61, 7.2±1.09, 5.4±0.54, 33±2.73and 5.4±1.94 for Cl. chauvoei, Cl. septicum,

Cl. novyi, Cl. perfringens C and Cl. perfringens D respectively .

Calves from dams in group C showed no detectable antibodies after ingestion of colostrum.

Time	C. chauvoei	C. septicum	C. novyi	C. perfringens C	C. perfringens D
0 (1st dose)	0	0	0	0	0
30 (2nd dose)	10.87±2.72	1.12±0.49	1.01±0.62	6.13±2.39	1.10±0.55
60	40.27±7.13	3.13±0.92	2.77±0.82	15.00±2.67	3.20±1.01
90	84.20±6.61	5.67±1.11	5.47±1.88	27.80±4.52	4.93±1.22
120	83.80±5.58	4.00±1.00	3.53±1.85	23.73±5.47	2.73±1.39
150	62.67±13.21	2.03±1.01	1.75±1.50	18.13±4.49	1.37±0.83
180	34.80±9.27	0.84±0.47	0.83±0.76	15.00±4.17	0.63±0.38

Table (1): Mean agglutination Antibody titers against Cl. chauvoei and antitoxin units forCl. Septicum, Cl. novyi, Cl. perfringens C andCl. Perfringens Din sera of vaccinated camel with polyvalent clostridial vaccine.

Group		C. chauvoei	C. septicum	C. novyi	C. perfringens C	C. perfringens D
A	serum	138±16.43	9.2±1.30	6.2±1.78	42±13.50	14.6±4.56
	colostrum	115±11.18	6.4±1.14	5±1.41	37±8.36	11.6±3.04
B	serum	10.8±2.77	0.52±0.31	0.1±0.07	5.4±1.14	0.122±0.08
	colostrum	6±2.12	0.242±0.23	0.04±0.05	3±1.87	0.04±0.05

Table (2) : Mean agglutination Antibody titers against Cl. chauvoei and antitoxin units for Cl. septicum, Cl. novyi, Cl. perfringens C and Cl. perfringens D in sera and colostrum from she camels vaccinated with polyvalent clostridial vaccine at the time of parturition .

Time	C. chauvoei	C. septicum	C. novyi	C. perfringens C	C. perfringens D
Before	0	0	0	0	0
24-36 hours	30±7.9	3.4± 1.34	3.8±1.30	26±4.18	7.4±1.81
7 days	26±4.18	1.6±0.89	2.2±1.30	18±2.73	3.6±1.34
30 days	19±4.18	0.72±0.408	1.1±0.54	13±2.73	1.3±0.67
60 days 1st dose	10±1.41	0.3±0.27	0.8±0.27	8.4±1.67	0.52±0.31
90 days 2nd dose	29±15.24	2.4±1.92	4.2±1.09	13.2±7.59	3.2±0.54
120 days	45±16.95	6±1.41	6.4±0.89	28±2.73	4.8±1.78
150 days	51±9.61	7.2±1.09	5.4±0.54	33±2.73	5.4±1.94
180 days	38±12.04	5.6±0.89	4.2±0.83	25±3.53	3.8±1.30

Table (3) : Mean agglutination Antibody titers against Cl. chauvoei and antitoxin units for Cl. septicum, Cl. novyi, Cl. perfringens C and Cl. perfringens D in sera of camel calves from dams in group B (Booster dose one month before parturition) .

Discussion

Infectious disease continues to be one of the most important constraints on the efficient production of farm livestock in both developing and developed countries. While vaccination and the therapeutic or prophylactic use of drugs both play an important role in animal disease control, vaccination is increasingly being viewed as the more sustainable option.

In the present work, we evaluate the immune response of camel to a commercial polyvalent clostridial vaccine. All animals received two doses with 4 weeks interval.

Of the 25 animals, 9 (36 %) animals developed injection-site lesions on day 28 post vaccination. These results agree with the previous results of (Beecher, 1995)where he reported an injection-site lesion percentage of 50, 50, and 30 on d 18, 33, and 54, respectively, on steer calves following clostridial vaccination. Injection-site lesions may be caused by many factors including the animal's sensitivity to the clostridial vaccines, the vaccination injury itself, the adjuvant used to enhance the immune response, and contamination at the time of vaccination.

In group A, the mean agglutinating antibody titer against Cl. chauvoei was 10.87 ± 2.72 on day 30 and animals still having a circulating antibodies against Cl. chauvoei up to day 180 . Cl. chauvoei is the cause of blackleg , a disease of ruminants characterized by high fever, serohemorrhagic swellings, and gas formation in the heavy muscles of the body and limbs. The disease has been reported to occur in the camel. (Morgan, 1981).

Regarding to the mean antitoxin titer for C. septicum, C. novyi , the animals showed a titer of 1.12 ± 0.49, 1.01 ± 0.62 on day 30 post vaccination respectively ; and animals still have antitoxins up to 180 days . On day 30, the mean antitoxin against C. perfringens type C and D were 6.13 ± 2.39and 1.10 ± 0.55 respectively. Results illustrated in Table (1) revealed that 2 doses of alum precipitated polyvalent clostridial vaccine elicited immune response in camel lasted for 180 days.

Privous studies in Sudan,Agaband Abbas (1998) , Kenya,(Mukasa- Mugerwa, 1981), Tunisia, (Burgemeister, 1974) and Somalia ,(Hussein, 1987), showed the main reasons for the high postnatal mortality in camel calves to be poor management practice and diseases. The newborn calf has no natural protection against diseases, as there is no antibody transfer from the mother during fetal development. The calf can obtain immediate immunization soon after birth only through the colostrum, which has a very high concentration of antibodies. Therefore, it is vital for the calf to suckle as soon and as much as possible.

Unfortunately there is a common belief among many pastoralists that colostrum causes diarrhoea and, consequently, is unsuitable for the newborn calf. This wide spread practice of withholding the colostrum from the newborn calves, depriving them of essential antibodies, is certainly a crucial factor in the frequently reported high calf mortality in pastoral production systems.

Animals in group B (5 pregnant she camel) received a booster dose one month before parturition in order to rise the serum antibody before parturition and subsequently increasing colostrum antibodies. On the day of parturition, serum and colostrum samples were collected from dams in group B and C, resultsin Table (2) showed that serum and colostrum from dams in group B had a significant high level of antibodies than those from group C where dams not received a booster dose one month before parturition. These results documented by (Fleenor and Scott , 1893 , Nawal, et al., 1994, Fayez and Said, 2004). In a previous study by (Kamber, et al.,2000), they reported that the IgG concentrations in the camel colostrum were higher on average than the values found in the literature for other domestic animals.

Concerning the results shown in Table (3) , the mean antitoxin titer against C. perfringens type C and D in the sera of newly born calves 36 hours after ingestion of colostrum were 26 ± 4.18, 7.4 ± 1.81 respectively. This indicate a transfer of passive maternal immunity to these calves. (McGuirk, et al., 1994).

The newly born camel calves still have antitoxins up to 60 days post ingestion of colostrum , 8.4±1.67 & 0.52±0.31 for Cl. perfringens type C and D respectively. Cl. perfringens type C causes severe enteritis with diarrhea and dysentery in young lambs, calves, pigs, and foals. Usually calves 7 to 10 days old are affected by Cl. perfringens type C, but calves up to 10 weeks of age may also be affected. In very acute cases, death occurs in a few hours, sometimes without diarrhea being evident (Radostits et al., 1994).Clostridium perfringens type D or pulpy kidney can cause sudden death in calves between 1 and 4 month of age. It is a short-term inhabitant that does not usually persist in the soil for more than 1 year (Radostits et al., 1994).

In conclusion, immunization of camel with 2 doses of alum precipitated polyvalent clostridial vaccine can protect the them from clostridial diseases. Booster dose one month before parturition provide a passive maternal immunity for the newly born calves in the age of susceptibility to clostidial diseases.

It is recommended to optimize the husbandry conditions of the calves and ensure that newly born calves suck the colostrum within 12 hours after birth.

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