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RESPONSE OF PREGNANT SHEEP AND GOATS TO A SPECIFIC VACCINE FOR PESTE OF SMALL RUMINANTS

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SUMMARY

Five susceptible pregnant dams of each of sheep and goats were vaccinated with PPR-attenuated vaccine, 50 to 60 days pre-partum. They, as well as, their offsprings remained clinically healthy. Post-partum serum PPR neutralizing antibody titres were generally lower than pre-partum peak titres in all animals. PPR antibody titres in the colostrum of these animals were generally appreciably higher than in their sera, throughout a test period of 48 hours post-partum. Reasonable serum titres of passively acquired PPR antibodies were fairly existing in the offsprings of both sheep and goats. Such antibodies persisted for 3 to 4 months with some individual variations. The majority of the offsprings reverted to seronegativity by the 5th month of age.

INTRODUCTION

FAO (1996) stated that PPR was currently circulating with devastating effect in sheep and goats across the Asian continent from Arabia through Pakistan, India and as far as Nepal and Bangladesh. Animal disease status worldwide in 1997, as reported by OIE (1998) mentioned the occurrence of pest of small ruminants "PPR" in countries in western, central and eastern Africa, the middle east and south Asia. The disease was reported for the first time in that year in Pakistan and in Somalia. The disease had been reported to occur in Egypt in limited outbreaks (House, 1987; Ikram et al., 1988; Abo El-Hassan et al., 1989; El-Sanousi et al., 1989; Ismail and House, 1990; Ismail et al., 1990; El-Allawy et al., 1993 and Mouaz et al., 1995).

Before the development of a specific homologous PPR vaccine (Diallo et al., 1989), the

heterologous Plowright RBOK rinderpest vaccine was widely used to protect small ruminants against PPR (Bourdin et al., 1970; Bourdin, 1973; Taylor, 1979; Bonniwell, 1980; Adu and Nawathe, 1981; Abegunde, 1983; Bonniwell, 1983 and Obi, 1983).

A specific homologous PPR attenuated vaccine was developed in Egypt (Khodeir and Mouaz, 1998). It proved to be safe and immunogenic for sheep and goats through ample quality control criteria (Abeer, 1997 and Afaf, 1998). It was also evidenced that normal physiological functions of the vital organs were found to be maintained in vaccinated animals (Hanan, 1998). It was also proved to be of such same merits on being inoculated simultaneously with attenuated Rift valley fever virus vaccine (Mouaz et al., 1998) or with attenuated sheep pox vaccine (Samir et al., 1999), in synchronized vaccination trials in sheep. Hence, the object of the present work was aiming at experimenting such a locally produced PPR attenuated vaccine in pregnant sheep and goat to find out their response to vaccination as well as to envisage the serological status of their offsprings and the role of the colostrum in this respect.

MATERIALS AND METHODS

MATERIALS :

Animals :

Five pregnant dams of each of sheep and goats, seronegative to both PPR and rinderpest viruses were used in the present study. Fifty to sixty days approximate before parturition, they were vaccinated with the attenuated PPR vaccine by dosing at 10^3 $TCID_{50}$/ml/head, given S/C, in the region of the neck. Two other pregnant dams (one sheep and one goat) of the same condition were held as non vaccinated non contact control animals, kept in a separate pen. Test animals were closely observed and clinically inspected throughout the experimentation period. All animals as well as their offsprings were seromonitored for PPR neutralizing antibodies at predetermined indicated intervals. Colostra of all animals were also tested at targeted intervals.

Serum samples :

Serum samples were collected from all dams as well as from their offsprings at predetermined intervals throughout experimentation.

Colostrum samples :

Colostrum samples were collected by hand milking and were treated as the serum samples.

Viruses :

Rinderpest virus:

The cell culture attenuated rinderpest virus (RBOK) at its 99th passage on bovine kidney cells was used to produce rinderpest vaccine on VERO cells.

The vaccine virus was used to screen tested animals sera (Plowright et al., 1971).

Peste Des Petits Ruminants Virus (PPRV) :

A VERO cell attenuated local strain (Egypt 87) of PPRV was used to screen tested animals sera and for vaccination as well as for quantifying PPR antibody titres in indicated test samples.

Cell cultures:

Certified VERO cells were used in cultures for vaccine manufacture of either rinderpest or PPR as well as for virus titration and neutralization tests.

METHODS:

Virus titration:

The infectivity titres of both rinderpest and PPR viruses were estimated according to the method described by Rossiter and Jessette (1982).

Virus neutralization:

Both quantitative and qualitative neutralization tests were done according to the method described by Rossiter and Jessette (1982). The neutralizing antibody titres were expressed as the reciprocal of the final serum or colostrum dilution inhibiting the CPE produced by 200 $TCID_{50}$/0.1ml of PPR virus suspension.

RESULTS

PPR vaccination of sheep and goat pregnant dams:

Clinical inspection:

Vaccinated animals remained healthy and gave birth to healthy normal offsprings. Non of the dams aborted. No teratogenic features could be detected in all offsprings. There was no twining in all tested animals.

Serological response to PPR vaccine:

Fairly high PPR neutralizing antibody titres ranging between 64 and 256 were detected 3 and 4 weeks post vaccination of dams. Control animals remained seronegative. Post partum serum titres of mothers were dramatically of lower levels (32-128), throughout a 48 hours post partum test period.

Colostral PPR antibodies:

Appreciably higher levels of PPR antibody titres could be estimated in colostral samples of mothers, ranging between 64 and 256 throughout the first 17 hours post partum. Colostral antibody titres ranging between 32 and 128 were found subsequently in samples collected at 24 and 48 hours post partum.

Table (1) : Serological response of pregnant sheep and goats to PPR vaccine and colostral transfer of neutralizing antibodies to offsprings

Test of	Time of sampling	Animals No.	Sheep						Goats					
			1	2	3	4	5	6**	1	2	3	4	5	6**
Pregnant dams	Just prior to vaccination		0*	0	0	0	0	0	0	0	0	0	0	0
	3 weeks post vaccination		64	256	128	64	128	0	256	128	64	128	256	0
	4 weeks post vaccination		64	256	128	64	128	0	256	128	64	128	256	0
Mothers	2 hours post partum		32	128	64	32	64	0	128	64	32	64	128	0
	7 hours post partum		32	128	64	32	64	0	128	64	32	64	128	0
	24 hours post partum		32	128	64	32	64	ND	128	64	32	64	128	0
	48 hours post partum		32	128	64	32	64	0	128	64	32	64	128	ND
Colostrum	2 hours post partum		128	246	256	128	128	0	256	128	64	128	256	0
	7 hours post partum		128	256	256	128	128	0	256	128	64	128	256	0
	11 hours post partum		128	256	128	128	128	ND	256	128	64	128	256	0
	17 hours post partum		128	256	128	128	64	0	256	128	64	64	256	ND
	24 hours post partum		64	128	128	64	64	0	128	64	64	64	128	0
	48 hours post partum		64	128	128	64	32	ND	128	64	32	64	128	0
Offsprings	Just prior to suckling		0	0	0	0	0	0	0	0	0	0	0	0
	2 days old		64	128	64	32	64	0	128	64	64	64	128	0
	5 days old		64	128	64	32	64	ND	128	64	64	64	128	0
	10 days old		64	128	64	32	64	0	128	64	32	64	128	0
	15 days old		64	128	64	32	64	0	128	64	32	64	128	ND
	30 days old		64	128	64	16	32	ND	64	32	16	32	64	0
	40 days old		64	128	64	16	32	0	64	32	16	32	64	0
	60 days old		32	64	64	8	16	0	32	16	8	16	32	ND
	90 days old		16	64	32	4	8	0	32	8	4	8	32	0
	120 days old		8	32	16	0	4	ND	16	4	0	4	16	0
	150 days old		0	16	0	0	0	0	8	0	0	0	8	0

* : PPR-neutralizing antibody titres expressed as the final dilution of serum or colostrum inhibiting the CPE of PPR virus (200 $TCID_{50}$/0.1) on Vero cells.

** : Non vaccinated non contact control animals. ND : Not Done.

Table (2): Geometric mean titres of PPRV-antibody in pregnant sheep, goats, mothers, colostra and offsprings.

Test of	Time of sampling	Animals	
		Sheep"5"	Goats "5"
Pregnant dams	Just prior to vaccination	0*	0
	3 weeks post vaccination	111.4	147
	4 weeks post vaccination	111.4	147
Mothers	2 hours post partum	55.7	73.5
	7 hours post partum	55.7	73.5
	24 hours post partum	55.7	73.5
	48 hours post partum	55.7	73.5
Colostrum	2 hours post partum	168.9	147
	7 hours post partum	168.9	147
	11 hours post partum	147	147
	17 hours post partum	128	128
	24 hours post partum	84.4	84.4
	48 hours post partum	73.5	73.5
Offsprings	Just prior to suckling	0	0
	2 days old	64	84.4
	5 days old	64	84.4
	10 days old	64	73.5
	15 days old	64	73.5
	30 days old	48.5	36.8
	40 days old	48.5	36.8
	60 days old	27.9	18.4
	90 days old	16	12.1
	120 days old	11.3	8
	150 days old	16	8

* PPR- neutralizing antibody titres were expressed as the reciprocal of the final dilution of serum or colostrum inhibiting the CPE of PPR virus (200 TCID50/0.1ml) on Vero cells.

Fig. (1): Geometric mean titres of PPRV- antibody in pregnant sheep, goat, mothers and colostra.

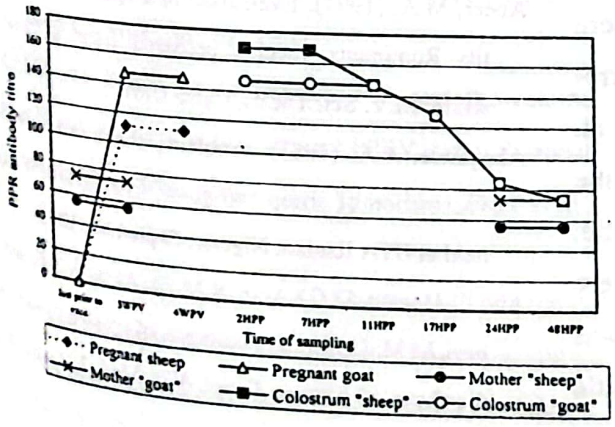
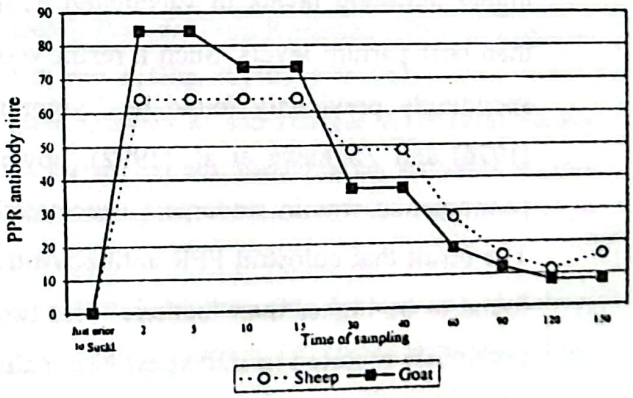


Fig. (2): Geometric mean titres of PPRV- antibody in sheep and goat offsprings.



Colostral transfer of PPR antibodies to offsprings: Offsprings were seronegative before suckling the colostrum. Seroconversion occurred after nursing. PPR neutralizing antibody titres ranging between 16 and 128 were traced up to the 40th day of age. At the age of 120 days, two sheep showed titres of 16 and 32. At the same age, two goats maintained a titre of 16. By the 5th month of age, only one sheep was seropositive in a titre of 16. Two goats of a serum titre of 8 were found at the same age.

DISCUSSION

Although the number of sheep and goats used in this study was only five of each, PPR vaccine seemed to be reasonably well tolerated by heavily pregnant animals. Negativity of obvious teratogenicity and absence of abortion would be considered additional proof of safety of this vaccine. Serological response in terms of neutralizing PPR antibody was fairly of appreciable levels in vaccinated dams, mothers, colostrum and in nursing offsprings. Tabulated results in this study denoted higher antibody levels in vaccinated dams' sera than post partum levels. Such a result was correspondingly previously found by Lyigoren et al. (1976) and Zaghawa et al. (1992), however the phenomenon was in rinderpest vaccinated cattle. The result that colostral PPR antibody titres were found to be higher than mothers' sera titres, was previously reported in rinderpest vaccinated cattle by Brown (1958). Our results seemingly indicate that the titres and duration of colostrally transferred PPR antibody in newborn sheep and goats incline to be directly proportional to the maximum titre acquired after nursing which in turn depends on the level of colostral antibody received within the neonatal period.

It seems that natural passively acquired PPR antibodies decline gradually at a uniform rate till disappear completely by approximately the fifth month of age. Correspondence in this respect was previously reported with rinderpest in cattle (Brown, 1958) and polio in infants (Martins et al., 1958). It could be withdrawn that PPR attenuated vaccine is safe and immunogenic for pregnant sheep and goat dams. It has no deleterious effect on them neither on their offsprings. In addition, newborn sheep and goats suckling the colostrum enjoy the acquisition of passively transferred PPR antibody that might be persisting up to the 3rd or 4th month of age.

REFERENCES

Abeer, M.A. (1997): Evaluation of a specific Peste des Petits Ruminants vaccine prepared from a local virus strain. M.V. Sci. Thesis, Cairo Univ.

Abegunde, A.A. (1983): Problems connected with TCRP, vaccination of sheep and goats. Proc. Inter. Workshop, held at IITA Ibadan, Nigeria, September 1983 : 79 - 81.

Abo El-Hassan, D.G.; Arab, R.M.H.; Ahmed, Y.F. and Ibrahim, M.M. (1989): An outbreak of erosive stomatitis and diarrhoea of goats in Egypt. Vet. Med. J., Giza, 37 (2) : 525 - 535.

Adu, F.D. and Nawathe, D.R. (1981): Safety of tissue culture rinderpest vaccine in pregnant goats. Trop. Anim. Hlth. Prod., 13 (3) : 166.

Afaf, A.A.W. (1998): Some studies on a thermostable Peste Des Petits Ruminants (PPR) vaccine. Ph.D. Thesis, Cairo Univ., 1998.

Bonniwell, M.A. (1980): The use of tissue culture rinderpest vaccine (TCRPV) to protect sheep and goats against Peste des Petits Ruminants in the Ashanti region of Ghana. Bull. Off. Int. Epizoot., 92 (11-12) : 1233 - 1238.

Bonniwell, M.A. (1983): The results of TCRPV in Ghana. In : Hill, D.H. (ed.) Peste des Petits Ruminants (PPR) in sheep and goats. Proc. Int. Workshop, Ibadan, Nigeria. 1980, 85 - 87. International Livestock Center for Africa, Addis Ababa.

Bourdin, P. (1973): Small ruminants plague and its prevention in Senegal and Western Africa. Rev. Elev. Med. Pays Trop., 26 (4) : 71- 74.

Bourdin, P.; Rioche, M. and Laurent, A. (1970): Use of a tissue culture vaccine in the prevention of small ruminant plague in Dahomey. Rev. Elev. Med. Pays Trop. Vet., 1 : 13 - 17.

Brown, R.D. (1958): Rrinderpest immunity in calves. The acquisition and persistence of maternally derived antibodies. J. Hyg., 56 : 427 - 434.

Diallo, A.; Taylor, W.P.; Lefevre, P.C. and Provost, A. (1989): Attenuation of a virulent PPRV strain: Potential homologous live vaccine. Rev. Elev. Med. Pays Trop., 42 (3) : 311 - 319.

El-Allawy, T.A.; Laila, S.A. and Abdel Rahim, I.H. (1993): Serological studies on Peste des Petits Ruminants (PPR) in Upper Egypt. Proc. 2nd Sci. Cong. Egypt, Soc. Cattle Dis., 5-7 December 1993, Assiut, Egypt 2 : 278 - 289.

El-Sanousi, A.A.; Abo El-Hassan, D.E.; Arab, R.M.; shalaby, M.A.; Saber, M.S. and Reda, I.M. (1989): An outbreak of rinderpest like disease among Egyptian wild rams. Vet. Med. J., 37 (2): 261 - 280.

FAO (1996): FAO Animal Production and Health. Paper. 129 : the world without rinderpest. P. 25.

Hanan, S.A.R. (1998): Metabolic and endocrine changes associated with active immunization of goats with PPR virus. Ph.D. Thesis, Cairo Univ.

House, J.A. (1987): Characterization of a Peste des Petits Ruminants (PPR) isolate from Egypt. Memorandum for the record. Plum Island Animal Disease Centre, N.Y. USA.

Ikram, A. Karim; El - Danaf, N.A.; El - Nakashly, S. and House, J. (1988) : Isolation of a viral agent from Egyptian goats suspected to be PPR - virus. J. Egypt. Vet. Med. Ass., 48 (3) : 429 - 435

Ismail, I.M. and House, J. (1980): Evidence and identification of Peste des Petits Ruminants (PPR) from goats in Egypt. Arch. Exper. Vet. Med., 44 : 471 - 474.

Ismail, I.M.; Mohamed, F.; Aly, N.M.; Allam, N.M.; Hassan, H.B. and Saber, M.S. (1990): Pathogenicity of Peste des Petits Ruminants virus isolated from Egyptian goats in Egypt. Arch. Exp. Vet. Med., 44 (5) : 789- 792.

Khodeir, M.H. and Mouaz, M.A. (1998): Preparation of a specific Peste des Petits Ruminants (PPR) virus vaccine. Vet. Med. J., Giza, 46 (4B) : 709 - 717.

Lyigoren, O.; Unlu, M. and Younguc, A.O. (1976): Studies on the pre and post partum serum antibodies in cows vaccinated against rinderpest. Et. Vet. Bak. Enst. Der., 4 : 59 - 71.

Martins, D.A Silva; Prem, M.; Johnson, M.; McKelvey, E.A. J. and L. Syverton, J.T. (1958): Response of pregnant women and their infants to poliomyelitis vaccine. J. Am. M. Assn., 168 : 1-5.

Mouaz, M.A.; Fayed, A.A.; Rawhia, E. Doghaim and Khodeir, M.H. (1995): Studies on peste des petits ruminants (PPR) in Egyptian sheep. Vet. Med. J., Giza, 43 : 367 - 374.

Mouaz, M.A.; Gehan, K.M.; Khirat, A.E.; Aida, I.E.D. and Khodeir, M.H. (1998): Evaluation of immune response of Egyptian sheep vaccinated with attenuated RVF and PPR vaccines. Assiut Vet. Med. J., 38 (6) :

Obi, T.U. (1983): Results of TCRPV vaccination in Nigeria. In : Hill, D.H.; (ed.). Peste des Petits Ruminants (PPR) in sheep and goats. Proc. Int. Workshop, Ibadan, Nigeria, 1980, 82 - 83. International Livestock, Centre for Africa, Addis Ababa.

O.I.E. (1998): O.I.E. International Committee Report of the 66th general session, Paris, 25-29 May, 1998. P.S. "Animal disease status worldwide in 1997".

Plowright, W.; Herniman, K.A.J. and Rampton, C.S. (1971): Studies on rinderpest culture vaccine. The stability of the reconstituted product. Res. Vet. Sci., 12 (1) : 40 - 46.

Rossiter, P.B. and Jassette, D.M. (1982): Microtitre technique for the assay of RPV and neutralizing antibody. Res. Vet. Sci., 32 : 253 - 256.

Samir, S.S.; Wafaa, A. Zaghloul; Soad, M. Soliman; Nahed, A. Kamel and Mouaz, M.A. (1999): Trials for vaccination of small ruminants using a combined PPR and sheep pox vaccine. Alex. J. Vet. Sci., 15 (3) :

Taylor, W.P. (1979): Protection of goats against Peste des Petits Ruminants with attenuated rinderpest virus. Res. Vet. Sci., 3 : 321 - 324.

Zaghawa, A.A.; El-Shinnawy, M.M.; Abdel-Hady, O.A.; Mouaz, M.A.; Khader, A.M. and Khoderi, M.H. (1992): Persistance of maternal antibodies to rinderpest virus in calves born to vaccinated dams. J. Appl. Anim. Res., 2 : 33 - 38.