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Heamatological Indices of Sahel and West African Dwarf Goats Vaccinated Against Pestes despetits Ruminants (PPR)

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Abstract

This project determined the effect of Peste des petit ruminants (PPR) vaccine on the haematological indices of two breeds of goats (Sahel and West African Dwarf) and evaluated the effects of breed and sex on the haematological parameters. Haematological indices of the initial sample (comprising ten Sahel and ten WAD breeds) were evaluated prior to vaccination. Thirteen of the twenty goats were vaccinated against PPR, while seven (four WAD and three Sahel) were not vaccinated thus serving as control. Fourteen days after the vaccination, the haematological parameters of the vaccinated and unvaccinated goats were again evaluated. The data were analyzed using unequal replication module in GENSTAT. The findings revealed variation in some of the parameters studied. PPR Vaccine had no significant ($P<0.05$) influence on neutrophil and lymphocyte. However, in the vaccinated goats, there was an increase in the lymphocyte numerical values. The increased values indicate different levels of immune status of goats. Sex had significant influence ($P<0.05$) on Haemoglobin (HB), Red Blood Cell (RBC) and Packed Cell Volume (PCV). While their values were lower in the male compared to the female in Sahel breed, the contrast was the case for WAD goats. The study revealed that PPR vaccination led to increased lymphocyte count, which will raise the immune status and enhance greater resistance of the goats to PPR challenges.

***Keywords**: Goats, Sahel and WAD breeds, Vaccination, Peste des petit ruminants, Resistance*

Introduction

Livestock are very important for both the subsistence and economic development of the African Continent. They provide a flow of essential food products throughout the year. In some countries, the industry is a major source of government revenue and export earnings (Brumby, 1990). Small ruminants such as sheep and goats are important source of animal protein in West African sub region. This is because trypanosomosis, which is major hindrance of cattle production in the region, has less effect on small ruminants (ILCA Annual Report, 1991). Leather industries also benefit much from these ruminants (ILCA/ILRAD, 1988).

In Nigeria, as in other African countries small ruminants (sheep and goats) contribute a substantial proportion of the nations meat supply (Majiyagbe, *et al*, 1991). They also sustain the employment and income of millions of people in rural areas, contribute draught energy and manure for crop production and are the only food and cash security available to many Africans (Brumby, 1990). In S ahelian countries, sheep and goats have developed greater resistance to drought, which has partially made up for the meat shortage caused by cattle loss. Their short

reproductive cycle also give them a major role in helping many Pastoral populations to survive and make a fresh start. In the humid tropics of Africa, small ruminants (sheep and goats) are often the only domestic herbivores, thus they are an essential element in the use of primary resources (grass) which man cannot use directly. In these areas, their relatively short reproductive cycle also allows livestock population to be quickly restored after the devastating epizootics that still sometimes occur, as well as allowing the rapid establishment of new flocks managed by improved husbandry methods. The indigenous breeds of sheep in order of importance are Yankasa (60%), West African dwarf (WAD 20%), Uda (10%) and Balami (10%). For goats, the order is Red Sokoto goat (50%), West Africa dwarf (d5%) and Sahel (5%) (Osinowo, 1992).

A serious constraint on small ruminant production in Africa has been the high prevalence of diseases and parasites, particularly in more humid areas. This causes high mortality among kids and lambs, diminishing the benefits of their reproductive performance (Ademosun, 2002).

One of the most serious diseases of small ruminants 'peste des petits ruminats' (PPR), was first recognized as a contagious "Rinderpest-like" condition in goats in Nigeria in 1930. Peste de petits ruminants (PPR) is a French name for the disease meaning disease of small ruminants (Nawette and Taylor, 1979). It is a severe, fast-spreading disease of mainly small ruminants characterized by the sudden onset, depression, fever, discharged from the eyes, foul smelling diarrhea and death (FAO, 1999). The disease is the most destructive viral disease among small ruminants (Bourdin, 1980). It is highly contagious and is often associated with high morbidity and high mortality (Durojaiye, 1980).

PPR is endemic in West Africa especially in the tropical areas. In most cases the humid Southern parts of the countries experiences more severe outbreaks than the Northern region. The outbreak occurs throughout the year especially during the earlier part of raining season. Its highest incidence is in kids of 4 – 12 months of age (Nduka and Ihemelandu, 1973; Obi, 1982; Durojaiye, 1980). Goats appear to be more susceptible and suffer a more severe clinical disease than sheep.

PPR is a source of enormous economic loss to farmers and stock owners in Nigeria. The disease has been difficult to quantity due to lack of precise statistical data. In the period 1978/79 a total of 2,700 goats were affected in 191 outbreaks resulting to the death of 1,115 animals in Oyo State (Durojaiye, 1980). Moreover, cases of abortion and mastitis have been associated with PPR (Obi, 1982).

Haematological indices of the animals may give some insight as to their production performance potentials. Various reports (Aba-Adulagba and Joshua, 1990; Nottidge *et al.,* 1999; Tambuwal *et al.,* 2002) have documented haematological and biochemical parameters of domestic species in Nigeria but only few were on goats and on the effect of PPR vaccine that is widely used for the prevention and treatment of the PPR diseases (Aikhuomobhogbe and Orheruata, 2006).

The full blood count (FBC), sometimes referred to as full blood examination or complete blood count is one of the most commonly performed blood test, as it can tell us so much about the health status of the individual. It is important for diagnosing conditions in which the number of blood cells is abnormally high or abnormally low, or the cells themselves are abnormal. A full blood count measures the status of a number of different features of the blood including:

- The amount of haemoglobin in the blood
- The number of red blood cell (RBC) count
- The percentage of blood cell as a proportion of total blood volume (haematocrit or PCV).
- The number of white blood cells (white cell count).
- The percentage of the different types of white blood cells (leucocytes differential counts) (Janeway *et al.*, 2001).

Peste de petits ruminants disease is a serious constraint limiting the productivity of small ruminants in Nigeria particularly in the humid and sub-humid areas. Goats are more susceptible to PPR than sheep, and younger animals are more susceptible than the adult ones. The use of the homologous PPR vaccine is effective in the control of the disease. Blood cell counts are used during diagnosis, treatment, and follow-up to determine the health of the patient. During treatment, blood counts are very important to determine if that treatment is depleting healthy blood cells. Haematological indices of the animals may give some insight as to their production performance potential. The study focused on determining the effect of PPR vaccine on the haematological indices of two breeds of goats (Sahel and West Africa Dwarf) reared semi-intensively in the sub-humid tropical environment and evaluate the effect of breed and sex on the haematological indices.

Materials and Methods

Study area

The experiment was conducted at the Teaching and Research Farm of the Faculty of Agriculture, Shabu-Lafia Campus, Nasarawa State University, Keffi. It is located in the Guinea Savanna zone of North Central Nigeria. It is found in latitude 08o 35 ^{0}N and longitude 08o 33^{0}E The mean monthly maximum and minimum temperatures were 34.55^{0}C and 25.65^{0}C at the time of the experiment, while the mean monthly relative humidity and rainfall were 72.50% and 126.55mm, respectively (NIMET, 2007).

Experimental Animals

Twenty kids comprising 10 each of West African Dwarf and Sahel (11 males and 9 females) were randomly purchased from goats reared semi-intensively in the locality.

The goats were kept semi-intensively and were provided with feed and water twice daily (morning and evenings). They had access to grazing within a secured paddock.

The goats were weighed and identified with tags prior to blood collections. The goats were apparently in good health condition with no history of previous vaccination nor given any treatment before they were purchased.

Collection of Blood Sample

3ml of blood was collected by jugular venipuncture from each animal into tubes containing sodium Ethylene Diamine tetra-acetic acid (Na-EDTA) as anticoagulant and the haematological values such as packed cell volume (PCV), haemoglobin concentration (Hb), total leucocytes (WBC) and red blood cells (RBC) were measured. Immediately, following the first blood sample collection, 13 of the 20 goats (6 WAD and 7 Sahel) were vaccinated against Pest des Petit ruminants (PPR) using PPR homologous vaccine (PPRV) from NVRI Vom. The remaining seven (4WAD and 3 Sahel) goats were not vaccinated, thus serving as control. Two weeks following the vaccination 5ml of blood were again collected by jugular venipuncture from each animal both vaccinated and unvaccinated into tubes containing Ethylene Diamine Tetra Acetic Acid (Na-EDTA) as anticoagulant and taken to the laboratory for determination of the haematological values.

Laboratory Analysis

Red Blood cell (RBC) and White Blood Cell (WBC) were determined using the haemocytometer. Packed Cell Volume (PCV) was estimated by microhaematocrit method and haemoglobin concentration (Hb) Schalm *et al.,* 1975), Thin blood smears were fixed in alcohol and stained with Giemsa stain for differentia WBC counts.

Data Analysis

The fixed effects considered are Peste des petits ruminants (PPR), breed and sex. The data were analyzed using unequal replication module in GENSTAT (2005).

Results and Discussion

Table 1: Effect of PPR Vaccine on the Haematological Indices of Sahel and WAD

Breed	Vaccine	HB (g/d)	NEU (g/dl)	LYM (g/dl)	WBC (g/dl)	RBC (g/dl)	PCV (g/dl)	TBP (g/dl)	Live weight (kg)
Sahel	Initial sampling	7.05	44.72	55.29	7.34	3.27	25.45	55.64	10.12
	Vaccinated	6.38	31.55	68.41	19.58	2.80	27.92	55.73	9.69
	Unvaccinated	6.87	47.82	53.00	12.24	3.10	23.21	56.23	10.54
WAD	Initial Sampling	7.30	40.92	58.89	18.44	3.17	27.05	56.14	7.66
	Vaccinated	7.52	30.60	69.34	21.29	2.30	25.41	51.25	6.42
	Unvaccinated	8.53	41.82	57.75	19.67	2.94	24.96	59.95	7.45
Significance		0.214^{ns}	0.847^{ns}	0.856^{ns}	0.610^{ns}	0.425^{ns}	0.513^{ns}	0.432^{ns}	0.950^{ns}
LSD		-	-	-	-	-	-	-	-

Table 2: Effect of Sex Haematological Indices of Sahel and WAD

Breed	Sex	HB (g/d)	NEU (g/dl)	LYM (g/dl)	WBC (g/dl)	RBC (g/dl)	PCV (g/dl)	TBP (g/dl)	Live weight (kg)
Sahel	Male	5.85	38.94	61.09	19.71	2.75	21.41	53.23	10.08
	Female	7.75	42.75	57.21	14.84	3.42	30.32	58.31	10.03
WAD	Male	8.39	37.80	62.16	22.09	3.07	28.98	58.85	7.37
	Female	6.78	37.65	62.01	17.07	2.62	23.32	51.59	7.06
Significance		0.006***	0.790ns	0.806ns	0.828ns	0.025*	0.019*	0.122ns	0.968ns
LSD		1.364	-	-	-	0.548	6.88	-	-

The descriptive statistics of the haematological value of Sahel and WAD breeds of goats reared semi-intensively is presented in Table 1 and 2. The findings revealed variation in some of the parameters studied. The values obtained are for the twenty (20) initial samplings, thirteen (13) vaccinated samplings and seven (7) unvaccinated samplings.

Peste des petit ruminants (PPR) Vaccine had no significant (P>0.05) influence on neutrophil and lymphocyte. (Table1). However, within the vaccinated goats, there was an increase in the lymphocyte numerical values. The increased values indicate different levels of immune status of the goats. The higher values are in agreement with the findings of earlier researchers on the subject ,matter that wide variation in leukocyte number is a reflection of the leukocytes' response to infection (Aikuomobhogbe and Orheruata, 2006).

The variations in the PCV values of 25.45% for Sahel and 27.05% for West African Dwarf goats have no statistical significance (P>0.05). The slight variations, however, compared favorably with the 27.25% reported for Balami goats (Azab and Abdel-Masoud, 1999) and 25.7% for Red Sokoto goats (Tambuwal et al., 2002) which is an indication that PCV varies from breed to breed. Similar observations were noted for the haemoglobin and the Red blood cell.

The effect of sex on the haematological indices of the two breeds of goats is represented in Table 4.2 and Figure 4.3. Sex had significant influence (P<0.05) on Hb, RBC and PCV. While their values were lower in the male (5.85g/dl) compared to the female (7.75g/dl) in Sahel breed, the contrast was the case for West African Dwarf goats, with the values being higher the male (8.39g/dl) than in the female (6.78g/dl), thus corroborating the finding of Egbe-Nwiyi et al., (2000) that sex had significant influence on the PCV values of goats. The value obtained for the Hb fall within the range of values obtained for Red Sokoto goats in Nigeria and is in agreement with the finding that male animals have higher values than female (Tambuwal *et al.,* 2002). This may be related to their higher level of exercise and social habbits.

Sex was observed to have slight effect on the lymphocytes though not significant (>0.05). The male Sahel and WAD goats had increased lymphocyte values

compared to the female animals, whereas the female Sahel had increased neutrophil values compared to the male Sahel goats.

Conclusion

Inclusion, the result of the study revealed that peste des petits ruminant's vaccination led to increased lymphocyte counts which will raise the immune status and enhance greater resistance of the goats to PPR challenges. Sex had significant influence on Hb, RBC, and PCV. Male animals have higher Hb value than the female.

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