# Relationship Between Gestation Length and Birth Weight in Nigerian Sheep and Their Crosses

**AO Iyiola-Tunji[1)*], GN Akpa[2)], BI Nwagu[3)], IA Adeyinka[3)], CU Osuhor[3)], TT Lawal[4)] and OA Ojo[2)]**

[1)] National Agricultural Extension and Research Liaison Services, Ahmadu Bello University, Zaria, Nigeria
[2)] Department of Animal Science, Ahmadu Bello University, Zaria, Nigeria
[3)] National Animal Production Research Institute, Ahmadu Bello University, Zaria, Nigeria
[4)] Animal Physiology Laboratory, Department of Animal Science, University of Ibadan, Ibadan, Nigeria
*Corresponding author email: tunjiyiola@yahoo.com; tunjiyiola@gmail.com

**Abstract.** Effect of genotype and birth weight on gestation length was evaluated using Nigerian breeds of sheep and their crosses. The study was carried out at the Sheep Project Unit of Small Ruminant Research Programme (SRRP) of National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Shika-Zaria. The sheep breeds used were Balami, Uda and Yankasa. Heat (estrus) detection was carried out twice daily; in the morning (07:00-08:00 hours); and in the evening (16:00-17:00 hours) using apron fitted rams to pick does on heat. A total of 56 lambs were used for this study. The data obtained were subjected to analysis of variance using General Linear Model and Correlation Procedure of SAS. All the genotypes had similar gestation length with values between 150.3±0.61 days and 153.3±0.60 days, except for Balami pure breed (BAL X BAL) lambs that recorded a shorter gestation length (137.1±0.81 days). There was a wide variation in the birth weight of lambs with the crosses between Balami rams and Yankasa ewes recording a distinct birth weight of 3.5±0.08 kg while the crosses obtained using Yankasa rams on Uda and Balami ewes gave the lowest birth weights (1.7±0.19 and 1.4±0.18, respectively). Sex and litter type have no significant effect (P>0.05) on gestation length. Birth weight was however affected by sex of lambs and their litter type. Litter type was negatively correlated with birth weight (-0.372). Gestation length had a low and non-significant relationship with birth weight; litter type and lamb genotype. Lamb genotype does not have a significant relationship with litter type. Genetic improvement of Nigeria sheep breed is possible if the resources of within and between breed is exploited. Selection for a reduction in gestation length may indirectly increase prolificacy.

**Key Words :** gestation length, birth weight, Nigerian Sheep

## Introduction

Bellows and Ansotegui (2005) defined gestation length as the physiological period during which the fetus develops in the dam. Gestation length is affected by several factors including sire breed (Fogarty et al., 2005), dam age, litter size and lamb weight at birth (Cardy and van Vleck, 1978 and Amoah et al., 1996). Longer gestation lengths had been recorded in older dams by Vatankhah et al. (2000) and Koyuncu et al. (2001). Ewes carrying single lambs also had longer gestation length when compared with those carrying multiples (Osinowo et al., 1994; Vatankhah et al., 2000; Koyuncu et al., 2001; Dwyer, 2003; Fogarty et al., 2005). Lamb weight was also reported to have influenced gestation length (Knight et al., 1988; Osinowo et al., 1994; Vatankhah et al., 2000; Fogarty et al., 2005) and may be longer when the dam is carrying a male lamb (Koyuncu et al., 2001; Vatankhah et al., 2000; Fogarty et al., 2005).

Bradford et al. (1972) and Dwyer et al. (1996) concluded that genotype of the lamb is more important than the dam in determining gestation length. Selection for a reduction in gestation length may indirectly increase prolificacy (Osinowo et al., 1994; Vatankhah et al., 2000). This study was therefore aimed at evaluating the effect of genotype and birth weight on gestation length of Nigerian breeds of sheep and their crosses.

## Materials and Methods

This study was conducted at the Sheep Project Unit of Small Ruminant Research Programme (SRRP) of National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Shika-Zaria. Zaria is located in the semi-arid, Northern Guinea savannah zone of Nigeria within latitude $11^0$08´N and longitude $07^0$41´E with an elevation of 2178 feet (663.77 metres) above sea level (http://www.trueknowledge.com/q/zaria_longitude_and_latitude). The sheep breeds used for this study were Balami, Uda and Yankasa which were subjected to diallel crossing. Heat (estrus) detection was carried out twice daily; in the morning (0700-0800 hours); and in the evening (1600-1700 hours) using apron fitted rams to pick does on heat. Ewes on estrus were separated from the herd into an isolated pen with an appropriate ram. These were allowed to be together for three (3) days under the assumption that mating would ensue. Pen mating was carried out at the ratio of 1 ram to 10 ewes. After the third day, ewes were returned back to their herd after appropriate records had been taken. Gestation length was calculated as the number of days between the date of successful mating and lambing. Birth weight and litter type of individual lamb was recorded immediately after lambing. A total of 56 lambs were used for this study. The pure breed lambs were 20 Yankasa (YK X YK), 11 Uda (UD X UD) and 5 Balami (BAL X BAL) while the crosses were 9 Yankasa X Uda (YK X UD), 6 Yankasa X Balami (YK X BAL), 3 Uda X Balami (UD X BAL) and 2 Balami X Yankasa (BAL X YK). The data obtained were subjected to analysis of variance using General Linear Model of SAS (SAS, 2004). Correlation procedure of SAS (SAS, 2004) was also used to obtain correlated relationships between parameters considered. Where analysis of variance depicted significant differences, Duncan Multiple Range Test (Steel and Torrie, 1980) was used to separate the means.

## Results and Discussion

The mean effect of lamb genotype on gestation length and birth weight is shown in Table 1. All the genotypes had similar gestation length with values between 150.3±0.61 days and 153.3±0.60 days except the Balami pure breed (BAL X BAL) lambs that recorded a shorter gestation length (137.1±0.81 days). The values observed in this study were higher than 148 days reported by McNeal (1987) as average length of gestation in sheep expect for the value recorded for pure Balami. Bradford et al. (1972) had explained that the genotype of the lamb is more important than the dam in determining gestation length. Fogerty et al. (2005) reported 2-3 days variation in gestation length due to sire breed. Dwyer et al. (1996), in an embryo transfer study to examine the effects of maternal and lamb genotype on characters of the dam and progeny, had found that regardless of ewe breed, gestation length was longer for Suffolk than for Scottish Blackface lambs.

There was a wide variation in the birth weight of lambs with the crosses between Balami rams and Yankasa ewes recording a distinct birth weight of 3.5±0.08 kg while the crosses obtained using Yankasa rams on Uda and Balami ewes gave the lowest birth weights (1.7±0.19 and 1.4±0.18, respectively). The birth weight obtained for pure breed lambs of YK X YK (2.0±0.11), UD X UD (2.1±0.16) and BAL X BAL (2.1±0.09) were lower than 2.6 kg, 2.7 kg and 2.8 kg reported by Atencio et al. (1979), Gonzalez (1972) and Bodisco et al. (1973), respectively for West African Dwarf sheep. Gonzalez (1977) and Combellas et al. (1979) also reported higher birth weight of 2.6 kg and 2.4 kg, respectively for Black-headed Persian sheep. As expected, the birth weight of pure breeds (YK X YK, UD X UD and BAL x BAL) were lower than the birth weight of crosses (BAL X YK and UD X BAL). This result can be attributed to heterotic effects.

Table 1. Effect of lamb genotype on gestation length and birth weight

| Genotypes | N | Gestation length (days) | Birth weight (kg) |
|---|---|---|---|
| YK X YK | 20 | 151.5±0.57[a] | 2.0±0.11[c] |
| UD X UD | 11 | 152.6±0.61[a] | 2.1±0.16[c] |
| BAL X BAL | 5 | 137.1±0.81[b] | 2.1±0.09[c] |
| YK X UD | 9 | 153.3±0.60[a] | 1.7±0.19[cd] |
| YK X BAL | 6 | 150.3±0.61[a] | 1.4±0.18[d] |
| UD X BAL | 3 | 151.3±0.67[a] | 2.7±0.17[b] |
| BAL X YK | 2 | 153.0±1.21[a] | 3.5±0.08[a] |
| Overall | 56 | 150.6±0.64 | 2.0±0.08 |

Values bearing different superscript at the same column differ significantly (P<0.05). N = Number of lambs

Sex and litter type was shown (Table 2) to have no significant effect (P>0.05) on gestation length. Birth weight was however affected (P<0.05) by sex of lambs and their litter type. This was in agreement with the report of Robinson et al. (1977) which stated that for lambs *in utero*, as the number of fetuses increases, the number of caruncles attached to each fetus decreases, thus reducing the feed supply to the fetus and hence the birth weight of the lambs.

The males had a higher birth weight than the females while the lambs born as singles (2.1±0.83) were heavier than those born as twins (1.7±0.16). Klindt (2005) had explained that endocrine functions are often sexually dimorphic, different in males and females. He explained further that programming of sexual dimorphism begins with embryonic expression of the sex-determining gene (SRY) in males and secretion of Mullerian-inhibiting hormone (anti-Mu¨llerian hormone, MIH), which prevents development of internal reproductive tracts of females.

Correlated relationships of parameters were shown in Table 3. Litter type was negatively correlated with birth weight (-0.372; P<0.01). This corroborates the fact that birth weight of lambs decreases as the litter number increases (Knight et al., 1988; Osinowo et al., 1994; Vatankhah et al., 2000; Fogarty et al., 2005). Gestation length had a low and non-significant relationship with birth weight (0.114; P>0.05); litter type (0.054; P>0.05) and lamb genotype (-0.101; P>0.05). Lamb genotype does not have a significant relationship with litter type (0.171; P>0.05).

Table 2. Effect of sex and litter type on estation length and birth weight

| | N | Gestation length (days) | Birth weight (kg) |
|---|---|---|---|
| Sex | | | |
| Male | 22 | 151.6±1.07 | 2.2±0.11[a] |
| Female | 34 | 150.0±0.80 | 1.8±0.12[b] |
| Litter type | | | |
| Single | 38 | 150.5±0.92 | 2.1±0.83[a] |
| Twins | 18 | 151.0±0.55 | 1.7±0.16[b] |
| Overall | 56 | 150.6±0.64 | 2.0±0.08 |

Values bearing different superscript at the same column differ significantly (P<0.05). N = Number of lambs

Table 3. Correlation coefficients

| Parameters | Gestation length | Birth weight | Litter type |
|---|---|---|---|
| Birth weight | 0.114[NS] | | |
| Litter type | 0.054[NS] | -0.372** | |
| Lamb genotype | -0.101[NS] | -0.099[NS] | 0.171[NS] |

** Correlation was significant at the 0.01 level.
[NS] Correlati on is not significant.

## Conclusions

Genetic improvement of Nigeria sheep breed is possible if the resources of within and between breed is exploited. Selection for a reduction in gestation length may indirectly increase prolificacy.

## Acknowledgement

The authors are grateful to the Director and management of NAPRI for the permission to conduct this research in the institute.

## References

Amoah EA, S Gelaye, P Guthrie and CE Rexroad (Jr). 1996. Breeding season and aspects of reproduction of female goats. J. Anim. Sci. 74: 723-728.

Atencio A, C Gonzalez, F Perozo, and L Elejalde. 1979. Crecimiento en Corderos mestizos West African x Persa Cabeza Negra. Asociacion Latincamericana de Produccion Animal Panama, VII Reunion.

Bellows RA and Ansotegui RP. 2005. Beef Cattle: Reproduction Management. In: Encyclopedia of Animal Science. Encyclopedia of Animal Science 13th Edition. Edited by Wilson G. Pond Alan W. Bell. Marcel Dekker, Inc. USA. Pp 1.

Bodisco V, Duque CM and Valle AS. 1973. Comportamiento productivo de ovinos tropicales en el period 1968-1972. Agronomia Tropical. 23:517-540.

Bradford GE, Hart R, Quirke JF and Land RB. 1972. Genetic control of the duration of gestation in sheep. J. Rep. and Fertil. 30:459-463.

Cardy RA and Van Vleck LD. 1978. Factors affecting twinning and effects of twinnning on Holstein dairy cattle. J. Anim. Sci., 46:950-964.

Combellas JB de, Martinez N and Gonzalez EJ. 1979. Estudio de algunos factores que influyen en el peso al nacimiento y al destete en corderos. Asociacion Latinamericana de Produccion Animal Panama. 7th Reunion.

Dwyer CM. 2003. Behavioural development in the neonatal lamb: Effect of maternal and birth-related factors. Theriogenology. 59:1027–1050.

Dwyer CM, Lawrence AB, Brown HE and Simm G. 1996. Effect of ewe and lamb genotype on gestation length, lambing ease and neonatal behaviour in lambs. Reprod. Fertil. Dev. 8:1123–1129.

Fogarty NM, Ingham VM, Gilmour AR, Cummins LJ, Gaunt GM, Stafford J, Edwards JEH and Banks RG. 2005. Genetic evaluation of crossbred lamb production. 1. Breed and fixed effects for birth and weaning weight of first-cross lambs, gestation length, and reproduction of base ewes. Austral. J. Agric. Res. 56(5):443-453.

http://www.trueknowledge.com/q/zaria_longitude_and_latitude Accessed on August 2, 2010.

Klindt J. 2005. Hormones: Protein. In: Encyclopedia of Animal Science. Encyclopedia of Animal Science 13th Edition. Edited by Wilson G. Pond Alan W. Bell. Marcel Dekker, Inc. USA. pp 520.

Knight TW, Lynch PR, Hall DRH and Hockey HUP. 1988. Identification of factors contributing to the improved lamb survival in Marshall Romney sheep. New Zealand J. Agricul. Res. 31:259–271.

Koyuncu M, Tuncel E and Kara US. 2001. Some environmental effects on birth weight and gestation length in Karacabey Merino and genetic parameters. Ziraat Fakültesi Dergisi, Atatürk Űniversitesi. 32(2):163-167.

McNeal LG. 1987. Feeding the pregnant ewe. Sheep Sheet. The Navajo Sheep Project. Sheepdex N-2.

Osinowo OA, Abubakar BY and Trimnell AR. 1994. Genetic and phenotypic relationships between gestation length, litter size and litter birth weight in Yankasa sheep. Anim. Rep. Sci. 34(2):111-118.

Robinson JJ, McDonald I, Fraser C and Crafts RMJ. 1977. Studies on reproduction in prolific ewes. I: Growth of the products of Conception. J. Agric. Sci. (Cambridge). 88:539-552.

SAS 2004. SAS User's Guide. SAS Institute Inc., Cary, NC, USA.

Steel RGD and Torrie JH. 1980. Principles and procedures of STATISTICS. 2nd edition. McGraw Hill, London, UK. 633 pp.

Vatankhah M, Edris MA and Salehi A. 2000. Study on gestation length and its relationship with numbers, sex and birth weight of lambs in each delivery in Bakhtiari sheep. Pajouhesh-va-Sazandegi. 46: 122-125.