

of animal protein which contains essential amino acids needed for human growth.

The predominant breeds found in Ghana are the West African Dwarf Goat (WADG) and the West African Long Legged (Sahelian) Goat. The Sahelian breed is found mostly in the three Northern regions of Ghana namely Upper East, Upper West and the Northern Region, whilst the West African Dwarf Goats are predominant in the Southern part of Ghana mostly in the Ashanti region because of the humid forest zones. Most of the goats in Ghana are kept on the free-range or extensive system of rearing animals where they are subjected to a wide range of diseases which include; Foot and Mouth Disease, Mastitis, Brucellosis, Tuberculosis, Q- Fever and of these disease conditions, pneumonia is considered the most important and dreadful respiratory disease condition of goats (Djene *et al*, 2013). Although literature abounds on the prevalence and economic implication of pneumonia in Nigeria (Emikpe and Akpavie, 2010a) the status of the condition in other West African countries is not certain. Caprine pneumonia can be attributed to factors such as the environment, climate, nutrition, stress and bad management practices, the influence of the age and sex on pneumonia prevalence has been well reported (Emikpe and Akpavie, 2010a, Djene *et al*, 2013), but the influence of breed on caprine pneumonia has not been fully elucidated in West African breeds of goats.

In this study, the pattern of distribution of pneumonic consolidations, the breed, age and sex influence on the prevalence of pneumonia in slaughtered goats in Ghana was investigated.

MATERIALS AND METHODS

Study area: The study area has been earlier described by some workers (Frimpong *et al.*, 2011). Briefly, Kumasi Abattoir Company Limited (KACL) which is located in the Kumasi Metropolis of Ghana served as the study area. The Kumasi Abattoir Company Limited (KALC) which was established in 1997 with aids from Government of Ghana and the Canadian International Development Agency (CIDA). The company commenced operations in 1998 and is located at Ahinsan/Kaase Industrial Area on 6°39'36.6°N Latitude and 1°36'15.4°W Longitude in the Kumasi metropolis of Ashanti region, Ghana. The abattoir is considered one of the busiest and largest in the country. Animals slaughtered at the abattoir include cattle, sheep, goats and pigs. There is a sheep and goat section, where the slaughtering, singeing and processing of goats is carried-out. There exists a small ruminants (sheep and

goats) market about 160 metres away from the slaughtering point, where most of the sheep and goats brought in from the various parts of the Kumasi metropolis, and the surrounding regions namely: Northern, Upper East, Upper West, Brong Ahafo, and Eastern; including some West African countries such as Burkina Faso, Mali, Niger, Cote d'Ivoire and Togo are assembled for purchasing by customers for slaughtering and other purposes. The slaughtering of goats is done on a daily basis, with an average daily slaughter of 100 goats. West African Dwarf Goat and the Sahelian breed constitute the predominant breeds of goat slaughtered at the abattoir. Male goats (bucks) as well as female goats (does) are slaughtered. Meat and Meat products from the abattoir are distributed and sold throughout the Kumasi metropolis to recognized butcheries and the adjoining districts such as Ejisu-Juaben, Asokore Mampong, Kwabre, Afigya Kwabre Obuasi, Bekwai, Atwima Nwabiagya, Atwima Kwanwoma, etc.

Data collection: Retrospective data on caprine pneumonia was not available at the Veterinary Service Department Unit. Daily sample collections and recordings on cases of pneumonia in goats were carried out at the Sheep and Goat Section of the abattoir through post mortem examination of the lungs. Ante-mortem examination of animals to be slaughtered was carried out with most of the animals not showing obvious clinical signs of a disease condition. Data was collected on age, sex, and breed of animals. Age was determined by dentition after slaughter using the dental formula. Sex was determined by checking the perineal region of the slaughtered goat to determine the type of sex organ. Breed differences between the West African Dwarf Goat and the Sahelian Goat was determined by examining the differences in the length of the fore and hind legs of goats after slaughter.

Sample Collection: Post mortem examination of 1,350 slaughtered goat lungs (1,012 Sahelian goats and 338 West African Dwarf goats) was conducted within the period of study (November 2013- May 2014). This was done through visual observation and gross palpation of the left and right portions of the lung together with the various lobes present was carefully done to determine the presence of lung consolidations as described by Emikpe *et al.*, (2011).

Replicas of the caprine lung were made on egg-shell cards which revealed the various lobes of the lungs pictorially and were used to diagrammatically represent the portion of lung affected and to which extent. The percentage of the affected to the lung lobe was estimated as described by Emikpe *et al.*, (2013). Formalin samples

from affected pneumonic lungs were made by storing trimmed portions of the pneumonic lung labelled bottles containing 10% buffered formalin; which were used for histopathology.

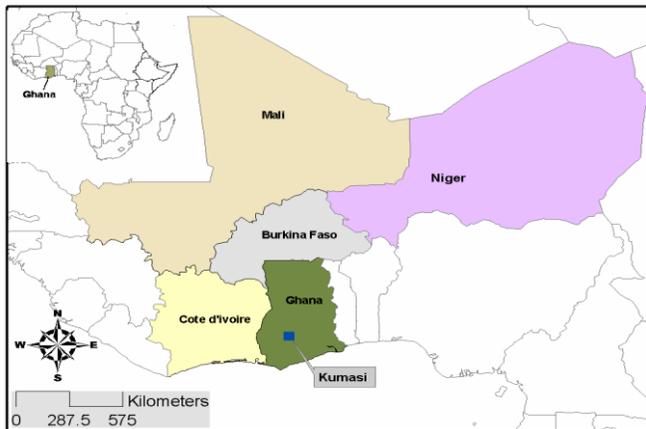


Fig 1
Sources from which animals in the abattoir are sourced.

RESULTS

Prevalence of Caprine Pneumonia

Of a total of 1,350 lungs of slaughtered goats of different breed, age and sex, examined at the Kumasi abattoir,

fifty five (55) goat lungs had pneumonia, giving a prevalence rate of 4.07%.

Pattern of distribution of pneumonic consolidations

Figure 2, showed the cranial lobe of the right lung was the most affected in both breeds when compared to the middle and caudal lobes of the right lung, with an average consolidation percentage of 3.70 and 5.67 for the Sahelian and WAD goat respectively. The two cranial lobes of the left lung had a total average consolidation of 2.2% (0.98+1.22). The caudal lobe of the right lung was affected more with a total consolidation of 5.99%, as compared to the left caudal with an average consolidation of 1.76% for both breeds. The Sahelian breed had higher caudal lobe consolidations in both lungs than the West African Dwarf goat. The middle lobe of the right lung was the least affected with respect to the other two cranial lobes of the right lung, with a total average consolidation of 3.75%; Sahelian breed with a higher consolidation than the West African Dwarf goat. 0.10% average consolidation was recorded for the accessory lobe in Sahelian breeds and 0% consolidation for WAD goats as presented in figure 2. A female Sahelian goat was observed to have multiple pulmonary abscesses.

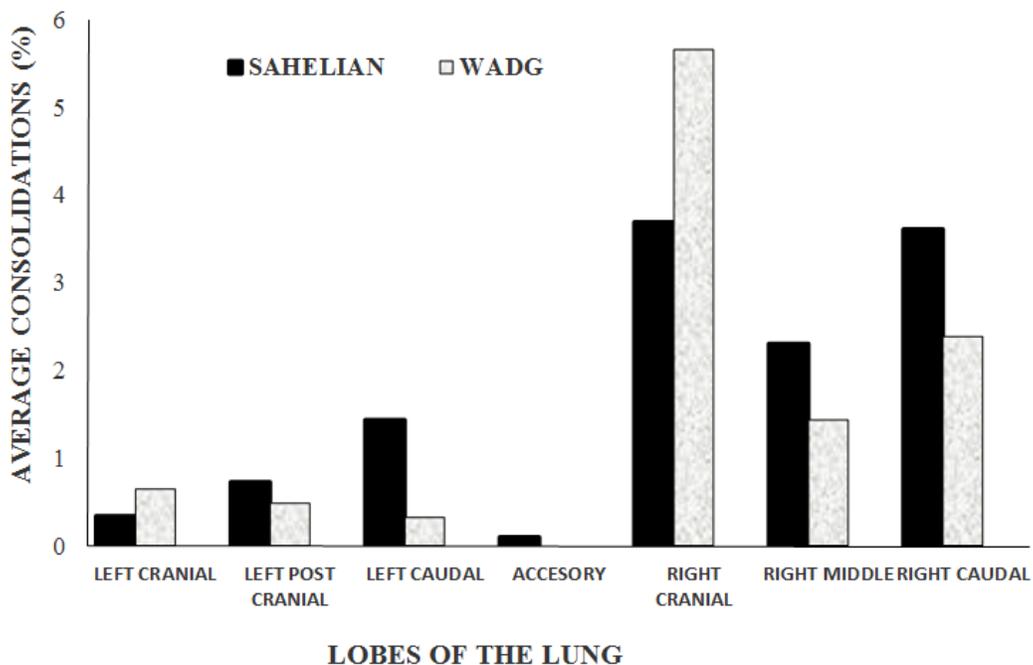


Figure 2.
Graph showing the pattern of distribution of pneumonic consolidations in slaughtered goats

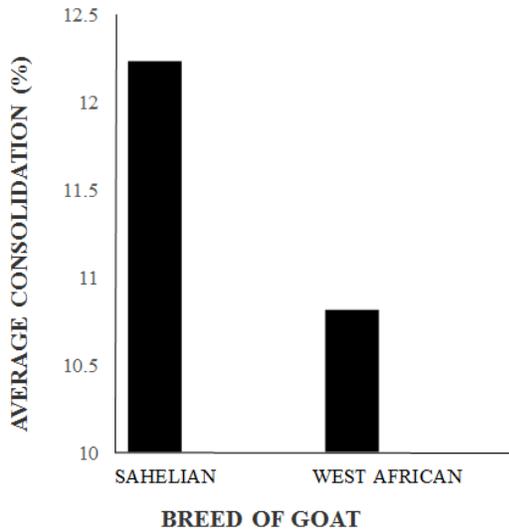


Figure 3
Graph indicating breed influence on pneumonic consolidations in goats

Age influence on pneumonic consolidations

From figure 4, the average pulmonary consolidation was mostly in goats from 1 to 2 years of age for West African Dwarf goats, with a mean lung consolidation percentage of 11.73, while goats of 3 to 4 years old showed 6.85%, those less than a year showed 6.7% average consolidation, and adult goats above 4 years showed no consolidations. Figure 4 showed adult Sahelian goats above four years of age were the most affected with pneumonia with an average consolidation value of 32.59%, followed by goats of 1 to 2 years with 12.23% mean consolidation, while those below 1 year of age showed an average percentage consolidation of 6.55.

Figure 5 shows female animals of both breeds had a higher pulmonary consolidation with a mean percentage value of 17.32 and 13.14 for the Sahelian and West African Dwarf goat respectively than the males having a mean percentage value of 7.26 and 8.47 for the Sahelian and West African Dwarf goat respectively.

Histopathology

Histological examination revealed that 75% of the cases had fibrinous and or suppurative bronchointerstitial pneumonia with giant cells. 25% of the cases are that of pulmonary abscessations,

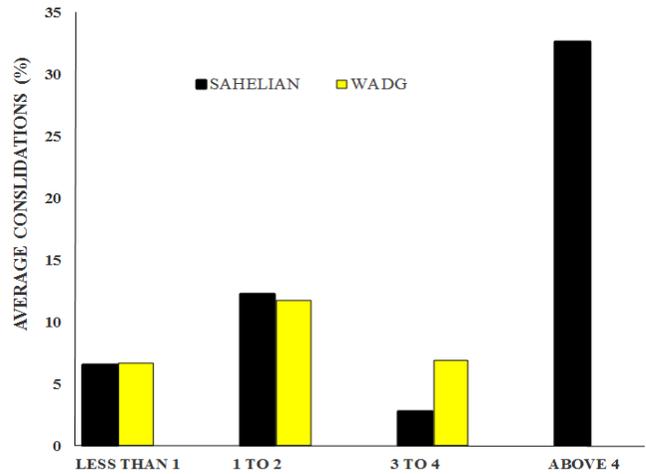


Figure 4
Effect of age on pneumonic consolidations in goats

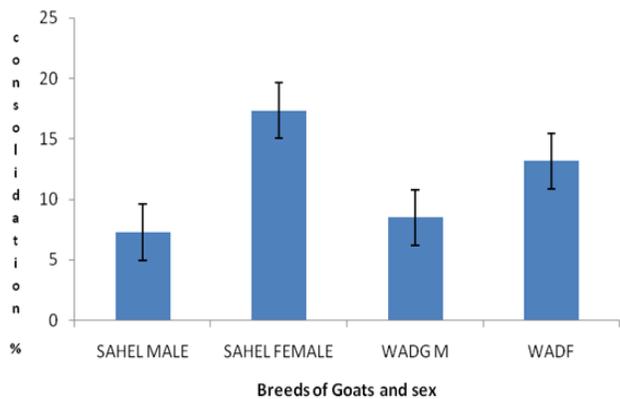


Figure 5
Effect of sex on pneumonic consolidations in goats



Plate 1
(A) Pneumonic lung of a 3 year old Sahelian goat, with the dark red ventral portion of right middle lobe being affected. (B) Pneumonic lung of a three year old West African Dwarf Goat, with left posterior cranial, right cranial and middle lobes affected. (C) Picture of a two year old West African Dwarf goat left cranial lobe of the lung filled with pus.

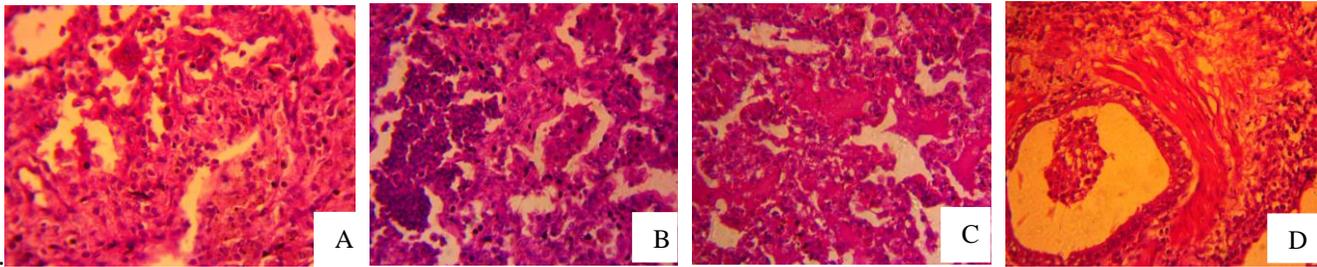


Plate 2

(A) Giant cell pneumonia (B) Purulent pneumonia. (C) Fibrinopurulent pneumonia. (D) Peri and intra bronchiolar cellular infiltration

DISCUSSION

This study described the prevalence and pattern of pneumonia in slaughtered goats in Kumasi abattoir of Ghana. The frequency of occurrence of pneumonia was higher in November and April. November, marked the beginning of the dry hamattan season, when there is shortage of grasses, and forages, this shortage could predispose animals to nutritional stress and with the combined effect of dust, the incidence of pneumonia could be higher. The month of April also marks the beginning of the rainy season in Ghana when cold weather precipitate respiratory disorders as opined by Al-Qudah *et al*, 2008 (6.6%) who did similar study in Jordan.

The relatively higher cranial lobar distribution may be due to the higher particle deposition which has been attributed to the shorter and abrupt branching airways to the cranial lobes (Emikpe and Akpavie, 2010b). Pneumonic consolidations were also recorded more in the right lung than left lung; which is attributable to the bifurcation of the trachea first to the right and at a distance to the left bifurcation as observed in West African dwarf goats by Emikpe and Akpavie (2010b).

From this study, the Sahelian breed was found to be more susceptible to pneumonia in comparison to the West African Dwarf goat. This could be possibly be explained by environmental, nutritional and transportation stress than the breed disposition. Most of the Sahelian breeds were from Mali and Burkina Faso which are drier areas, where there is a lot of dust, transport stress and less forage. Stress associated with early weaning or absence of maternally derived antibodies and unrestricted movement could also precipitate more pneumonic consolidations in goats especially goats from 1 to 2 years as opined by Emikpe *et al*, 2013, who found high pneumonic consolidations in goats between the ages of 6 months to 2 years.

Most of the goats both Sahelian and West African Dwarf goat female animals slaughtered at the abattoir were found to be pregnant after evisceration. The

physiological stress these pregnant animals undergo as well as stress of transportation may account for more pneumonic consolidations recorded for the does, as compared to the bucks. This findings is in contrast to the report of Emikpe and Akpavie, 2010, who reported high consolidation in bucks attributable to the sniffing of the females by the males during estrus, exposing them to the PPR virus (Emikpe *et al*, 2013).

Histological examination revealed the presence of giant cell, fibrinous and suppurative bronchointerstitial pneumonia suggesting complicated viral pneumonia which was observed to be the most important caprine pneumonia in slaughtered goats in Ghana. This study showed that the giant cell pneumonia observed could be associated with bacterial complicated PPR commonly reported in goats (Emikpe and Akpavie 2011)

In conclusion, there is a prevalence of 4.0 % pneumonia in goats slaughtered at the Kumasi Abattoir, with evidence of giant cell pneumonia, fibrinopurulent and suppurative bronchopneumonia. Pneumonic consolidations are distributed more to the right lung than to the left lung, with the cranial lobe being affected more. Age and sex had influence on the susceptibility of goats to pneumonia (Lawal *et al*., 2011). Breed of animal plays a role in the susceptibility of goats to pneumonia with the Sahelian breed being more susceptible. The major contributory factors identified were transportation and pregnancy stress associated with moving animals into the country. Therefore, the examination of goats at ante mortem for pregnancy detection should be encouraged to minimize the slaughtering of pregnant does. Transportation stress should also be minimized through resting of animals at regular intervals. Border checks on movement of animals should be strengthened to ensure the transit of pneumonia free animals into the country

REFERENCES

Al-Qudah K.M., Al-Majali A.M. & Obaidat M.M. (2008): A study on pathological and microbiological conditions in

goats in slaughterhouses in Jordan. *Asian J Animal Vet Adv*, **3**, 269-274.

Aziz M.A., (2010): Present status of the world goat populations and their productivity, *Lohman Information*. 45 (2), 42-45.

Devendra, C. (1999): Goats: Challenges of increased productivity and improved livelihoods. *Outlook. On Agric*. 28, 215-226.

Dejene S., Abede B., & Degefu H. (2013): Study on the Major health problems that causes carcass and organ condemnation at Hashim's Export abattoir, Debrezeit, Ethiopia. *Global Veterinaria* 11 (4): 362-371,

Dohare A.K., Singh B., Bangar Y., Prasad S., Kumar D., & Shakya G. (2013): Influence of age, sex and season on morbidity and mortality pattern in goats under village conditions of Madhya Pradesh, *Vet. World* 6(6):329-331.

Emikpe B.O. & Akpavie S.O. (2010a): The prevalence of peste des petits ruminants virus antibodies in goats from selected rural and urban communities in Ibadan Nigeria. *Bull Animal Prod Health Africa*, 58 (2), 147-153.

Emikpe B.O. & Akpavie S.O. (2010b): The pattern of distribution of pneumonia in experimental *Peste des petits ruminants* Virus and/or *Mannheimia hemolytica* infection in West African Dwarf goats. *Int. J. Morphol.* 28(2), 563-568. <http://dx.doi.org/10.4067/S0717-95022010000200037>

Emikpe B.O. & Akpavie S.O. (2011): The clinicopathologic effects of *Peste des petits ruminants* virus infection in West African dwarf goats. *Small rumin Res* 95 (2, 3), 168-173 doi:10.1016/j.smallrumres.2010.09.009

Emikpe B.O., Jarikre T.A., & Eyarefe O.D (2013): Retrospective study of disease pattern and type of pneumonia in Nigerian small ruminants in Ibadan, Nigeria. *AJBR* 16, 107 - 113

Frimpong S., Gebresenbet G., Bosona T., Bobobee E., Aklaku E., & Hamd I. (2011): Animal Supply and Logistics Activities of Abattoir Chain in Developing Countries: The Case of Kumasi Abattoir, Ghana. *Journal of Service Science and Management*, 2012, 5, 20-27.

Gatenby M. R.: Sheep. In: Coste, R., Smith, J. A. (Eds), (1991): The Tropical Agriculturist. Macmillan Educational Ltd, CTA, London, 1991, 6-10.

Lawal Adebola., Lasisi O.T., Emikpe, B.O., & Ogundipe G.A.T. (2011): Outbreak of *Peste des Petits Ruminants* in West African Dwarf Goats in Eruwa, Southwestern Nigeria. *Nigerian Vet J*, **32** (4), 331-335

Lebbie, S. H. B. (2004). Goats under household conditions. *Small Ruminant Research*. 51(2), 131-136.

Ministry of Food and Agriculture (MoFA), (2010): Facts and figures (2010). Statistics, Research and Information Directorate (SRID) pp. 18&19.