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ASSOCIATED PROBLEMS OF CRYPTORCHIDISM AND ITS POSSIBLE CONTROL AMONG POPULATION OF SMALL RUMINANT IN NIGERIA – A REVIEW

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Abstract
Cryptorchidism is failure of one or both testes to be positioned in the scrotum at the time normal for a species. It is symptomatic of underlying testis dysgenesis. Currently, it is accepted that cryptorchidism has many causes including genetic, epigenetic, and environmental components. The condition is not a single disease; it apparently results from failure of one or at least two functions involving products of leydig cells. Hence, the male breeding soundness examination (BSE) is an important component of small ruminants (sheep and goat) farming. BSE includes body condition score, macroscopic and microscopic evaluation of semen and is best performed two months before the breeding season. Small ruminants are classified based on one of these four categories: unsatisfactory, questionable, satisfactory, and excellent. The satisfactory males will achieve good reproductive performance if joined to females at a mating ratio of 1:50 for 60 days. Overall, the examination of the reproductive capacity in rams and bucks is an important tool for improvement of flocks/herds fertility and prevention of conditions like cryptorchidism.
Keywords: Cryptorchidism, fertility, small ruminants, breeding soundness, selection.

Introduction
Cryptochidism is seen more often in horses, cats, dogs and pigs while its rare in ruminants (Mahmud *et al.*, 2015). However, under some production systems where deliberate selection against deleterious traits is not being practiced, cryptorchidism is common among small ruminants (Ayodeji and Suwaiba, 2013). Under natural mating conditions, the reproductive performance of rams and bucks can be affected by several factors which are categorized as: sperm production factor, semen quality factor and delivery of semen to the female genital tract. Male breeding soundness examination (BSE) has become common practice in all domestic animal species. This examination is meant to forecast the ability of a male to fertilize the eggs of a given number of females within a defined period of time. It is not a fertility test because many males that do not meet the requirements set for the BSE may not be completely sterile and can even fertilize the eggs of a large number of females under specific management (Gouletsou and Fthenakis, 2010; Ridler *et al*., 2012; Van Metre *et al*., 2012). Cryptorchidism is among the common congenital abnormalities reported in surveys of reproductive tract abnormalities detected at birth or shortly thereafter. Post-pubertal abnormalities associated with cryptorchidism are not caused by elevated temperature of an abdominal location (Veeramachaneni, 2006), but as a delayed manifestation of testis dysgenesis. This paper hereby reviews the prevalence, causes and possible control measures of cryptorchidism among populations of small ruminants.

Prevalence of Cryptorchidism in Small Ruminants
Mamoulakis *et al.* (2012) classified testes position in mammals as transabdominal and inguinoscrotal which can be further divided into: embryonic (no descent from the ancestral/embryonic position), intermediate (partially descended, intra-abdominal position), internal inguinal, emergent (some part protrudes through the inguinal ring), beyond the inguinal ring but not within a true scrotum) and scrotal (into a true scrotum). Cryptorchidism can either be unilateral or bilateral (Colville and Joanna, 2002), and is usually seen unilaterally (Barth, 2006; Ayodeji and Suwaiba, 2013). Among unilateral cryptorchid

animals, the right testicle is retained in the abdomen in approximately 80 to 90% of affected animals (Smith *et al.,* 2007). Some studies have shown that left and right testicular retention are almost equal in occurrence (Acland, 2001). In the report of Smith *et al*. (2012), 83 cryptorchid testes (57 unilateral and 13 bilateral) were recognized in 70 animals post-slaughter at three abattoirs in the south west of England.

Cryptorchidism is rare in ruminants hence its low prevalence among the genital abnormalities of goats (Edmondson *et al.,* 2012). The prevalence of cryptorchidism in animals was reported as 0.1-12% (Amann and Veeramachaneni, 2007), while the prevalence of the condition in feral goats in Australia and native goats in Iran were 1.1 and 2.9%, respectively (Kafi *et al*., 2007). In South-eastern Nigeria, unilateral cryptorchidism was reported in West African Dwarf (WAD) goats (Emehelu *et al.,* 2005; Wekhe *et al.,* 2006) with a high prevalence of 70% in an area where persistent breeding with cryptorchid bucks occurred. Ezeasor (1985) report that unilateral cryptorchidism is a common condition among WAD goats of south-eastern Nigeria with the right testes being consistently retained and abdominal in position. In semi-arid zone of North-western, Nigeria, Ayodeji and Suwaiba (2013) recorded a prevalence of 1.74% in bulls similar to the report of Kumi-Diaka *et al.* (1989) but contrary to the reports of Amann and Veeramachaneni (2007), who reported prevalence rates of less than 0.5% in bulls and 0.1 - 0.7% in sheep.

Causes of cryptorchidism in animals

The causes of cryptorchidism have been attributed to gene, anatomy or endocrine system (Mattos *et al*., 2000). Little is known about the pathogenesis of cryptorchidism in bulls, although it is believed to be hereditary, while in rams, it is most likely to be as a result of an autosomal recessive mode of inheritance, but it may also be due to a dominant gene with the incomplete penetrance (Foster and Ladds, 2006). For endocrine cause, it is believed to be as a result of abnormal production of testosterone or absence of Mullerian inhibiting hormone since normal testicular descent requires both for it to occur (Ozygit, 2007). In some species of animals, other factors have been incriminated including prolonged breech labour (Depue, 1984), navel infections during testicular descent exposure of the fetus to an increased maternal estrogen concentration (Depue *et al*., 1983), or antiandrogenic chemicals (Hutson *et al.,* 1994) or maternal vitamin A deficiency during fetal development.

Abnormalities associated with cryptorchidism

Pinar *et al.* (1997) reported that unilateral abdominal cryptorchidism in male goats can cause disturbances at the end of spermatozoa maturation during spermiogenesis of the normal testis, but not in the epididymal maturation process. Males and females carry the cryptorchidism gene and can transmit the pathology to their offspring's (Nascimento and Santos, 1997). Thus, it is important to realize that normal animals can transmit the pathology due to its recessive character (Mickelsen and Memon, 1995). Neoplasia, in the ectopic testis are more frequent than in the eutopic, being sertoli cell tumors and seminomas mainly, and they generally appear in animals of six to ten years of age (Niemand and Suter, 1992). When cryptorchidism is bilateral, the animal is sterile (Nascimento and Santos, 1997).

Criteria for Culling of Rams and Bucks

Eliminate ram or buck from the herd that displays poor conformation such as cryptorchidism, a genetic malformation where only one or no testicles descend in the scrotum. A ram or buck with hypoplasia or undeveloped testicles is usually a sign of genetic abnormalities. When a ram or buck presents testicular hypoplasia, or testicular under development, it may be infertile and display an abnormal penis and prepuce. In addition, watch for orchitis, an inflammation of the testicle(s). These conditions can cause sterility.

Eradication of cryptorchidism

Reduction in occurrence of cryptorchidism should include trying to eliminate exposure of pregnant females to environmental agents likely to be estrogenic or anti-androgenic, or toxic via other mechanisms.

This is not easy, as most exposures are unintentional and unknown. However, there is strong evidence that altered fetal development can occur at concentrations of estrogenic or anti-androgenic agents not causing detectable damage to the dam or other adults (Gore *et al.*, 2006 and Sharpe, 2006). Concurrent exposure to low concentrations of several agents of the same type (e.g., estrogenic) might impose a damaging combined concentration on fetal tissues at a critical point in development. Ideally, unilateral cryptorchid males would not be used for breeding because there is risk that the trait will be transmitted to progeny. Determination of actual risk from breeding to unilateral cryptorchid males, the sire or siblings of cryptorchids, would be difficult and costly.

Conclusion

A herd sire (buck or ram) is the most important animal in the herd. The sire contributes 50 percent of the genetic makeup of every offspring born and determines pregnancy rate of the herd. The choice of good breeding stock is an important factor and fundamental in a small ruminant operation. Cryptorchidism poses an economic problem especially in breeding industries. Thus, when encountered, strict control measures outlined above should be in place as it is believed to be hereditary.

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