

## PUBERTY AND EPIDIDYMAL SPERM RESERVES IN THAI NATIVE BUCKS

P. Suttiyotin, J.T.B. Milton, and S. Saithanoo

Department of Animal Science, Faculty of Natural Resources,  
Prince of Songkla University,  
Hat Yai 90110, Thailand

<sup>1</sup>Resident advisor, Thai-Australian Prince of Songkla University  
Project, Faculty of Natural Resources,  
Prince of Songkla University,  
Hat Yai 90110, Thailand

### ABSTRACT

All Thai native bucks (12) had spermatozoa in ejaculates by 3.7 months of age and separation of the urethral process was complete by the time most bucks had live spermatozoa in ejaculates. Pubertal weight was about 30% of potential mature live weight. To avoid undesirable matings, bucks need to be separated from females from before about 3.5 months of age and prior to complete separation of the urethral process. Total epididymal sperm reserves of 5 month old bucks were about 50% of those for mature bucks, but the minimum age for acceptable levels of fertility with regular matings or semen collections need to be determined.

### INTRODUCTION

In villages in southern Thailand, native does kid throughout the year and bucks may run with does from birth until slaughtered or sold at up to three years of age. This results in uncontrolled matings with maiden does conceiving as young as 4 months of age and, along with post-partum does, experiencing the stress of pregnancy and lactation at unfavourable times of the year. These factors and inbreeding contribute to the low productivity of native goats in the region (Saithanoo and Milton 1989 and Saithanoo 1990). Saithanoo (1990) reported that for cultural reasons, male goats in villages are often not castrated. The age when Thai native bucks attain puberty needs to be known so young bucks can be separated from females to control mating as a management strategy to improve village goat production.

Two studies were conducted at the Thai-Australian Prince of Songkla University Project (TAPSUP) in southern Thailand using Thai native bucks. Study A determined the age and live weight at three peri-pubertal phases:- separation of the urethral process, first appearance of spermatozoa in ejaculates, first appearance of live spermatozoa in ejaculates and semen characteristics when ejaculates contained spermatozoa. Study B compared the epididymal sperm reserves of 5 month and 3 year old bucks.

## MATERIALS AND METHODS

### Study A

Twelve bucks were randomly selected from 53 male kids born in April 1986. The bucks were weaned at 12 weeks of age and managed as described by Milton *et al* (1987). The urethral process was inspected weekly, commencing at 40-45 days of age (mean live weight 6.9 kg) until completely separated from the prepuce and glans penis. Ejaculates were collected weekly by electro-ejaculation commencing when the penis could be conveniently held in a collection vial. Ejaculate volume (Volume) was recorded to the nearest of 0.1 ml and the concentration of spermatozoa in fresh semen was determined by counting in a haemocytometer after diluting the semen 1/200 with formal saline. Smears stained with Nigrosin-Congo Red were examined under oil emersion and the percentage of live spermatozoa (Live %) determined from a count of 200 spermatozoa in random fields. A sample of ejaculate held at 36°C on a slide was examined at 100 x magnification and mass activity (MA) was visually scored 0 (no activity) to 10 (many vigorous waves).

### Study B

Epididymal sperm reserves were determined by direct measurement using the technique described by Amann and Almquist (1961) in 5 young (5 months) and 5 adult (3 years) Thai native bucks. After slaughter, the epididymis was divided into caput, corpus and cauda and each portion was cut into small pieces, soaked in 0.9% NaCl and homogenized at room temperature. Tissue debris was removed from the homogenate by filtering through surgical gauze and the number of spermatozoa in each portion was counted using a haemocytometer. The data were analysed by analysis of variance and differences between means were tested by Duncan's new multiple range test.

## RESULTS AND DISCUSSION

### Study A

The average age of the bucks when separation of the urethral process was complete, when spermatozoa first appeared in ejaculates and ejaculates first contained live spermatozoa were 122, 97 and 132 days, respectively (Table 1).

No animal could be ejaculated before 88 days of age and 3 bucks had spermatozoa in their initial ejaculates at 93, 105 and 107 days of age. All spermatozoa were dead at first appearance in ejaculates; the apparent MA for 3 bucks (1 buck scored 2 and 2 bucks scored 1) is likely due to operator inexperience in examination of semen. Separation of the urethral process for all bucks was not complete until 1 to 3 weeks after first appearance of spermatozoa in ejaculates and for 9 bucks 1 to 4 weeks before and for the other 3 buck, 1 week after semen contained live spermatozoa. This concurrence of complete separation of the urethral process with the apparent presence of spermatozoa in the epididymis is consistent with the report of Yao and Eaton (1954) for Toggenburg bucks and bucks of mixed breeding, and the age for the bucks for these events in their histological

Table 1 Mean age, live weight and (range) for 12 Thai native bucks at 3 peri-pubertal phases and their semen characteristics

Attribute	Peri-pubertal phase		
	Separation of Urethral process	1 <sup>st</sup> Sperm in ejaculate	1 <sup>st</sup> Live sperm in ejaculate
Age (days)	122 (110-136)	97 (93-113)	132 (118-142)
Live weight (kg)	14.0 (12.1-16.2)	13.3 (11.6-15.2)	14.3 (12.8-16.7)
Semen Volume (ml)	-	0.46 (0.1-1.1)	0.33 (0.1-0.7)
Semen MA (0-10)	-	0.33 (0-2)	5.1 (1-9)
Spermatozoa x 10 <sup>6*</sup>	-	1.5 (0.01-5.25)	145.3 (1.9-590)
Live %	-	0	68.0

\*Total number of spermatozoa in ejaculates

study (112 and 110-125 days, respectively) are similar to those recorded in study A. The mean live weight of the bucks when spermatozoa appeared in semen was about one-third that of 33 months old Thai native bucks raised at TAPSUP (39 kg).

Lindsay *et al* (1982) defined puberty as the stage at which spermatozoa appear in the ejaculate and suggested that the approximate age at puberty for bucks is 4-6 months. Based on this definition, all bucks in the present study attained puberty by 113 days of age (3.7 months) - possibly one buck less than 93 days and 2 less than 107 days, with 9 bucks from 99 to 113 days of age. The minimum time from first appearance of spermatozoa in semen until any buck had live spermatozoa in his semen was 2 weeks. Despite displays of male behaviour and mounting of females, no males have effected pregnancies prior to weaning at 12 weeks of age during the past 5 years at TAPSUP. It would be prudent to separate Thai native bucks from females before about 3.5 months of age, prior to complete separation of the urethral process and/or before they reach about one-third of their potential mature live weight.

Puberty may be delayed under village conditions where there are constraints upon growth and development of bucks and owners often cannot recall the age of kids. Provided restrictions on kid growth are not severe as to delay separation of the urethral process, observation of the degree of separation of the urethral process could be useful to gauge the onset of puberty in village bucks of unknown age.

#### Study B

The results from Table 2 show that total epididymal sperm reserves in the young bucks were significantly lower than that in the older bucks ( $P < 0.001$ ) largely due to about 50% lower sperm reserves in the cauda portion of the epididymis of the young bucks.

Table 2 Number of spermatozoa ( $\times 10^9$ ) in epididymis of young and adult Thai native bucks. Figures presented are means  $\pm$  standard errors.

Age		Epididymis			Total spermatozoa in epididymis
		Caput	Corpus	Cauda	
5 months	Right	0.86 $\pm$ 0.06	0.15 $\pm$ 0.02	5.85 $\pm$ 0.37	6.33 $\pm$ 0.82
	Left	0.78 $\pm$ 0.04	0.13 $\pm$ 0.01	5.72 $\pm$ 0.82	6.86 $\pm$ 0.32
	Means	0.82 $\pm$ 0.04 <sup>a</sup>	0.14 $\pm$ 0.01 <sup>a</sup>	5.79 $\pm$ 0.42 <sup>b</sup>	6.75 $\pm$ 0.41
3 years	Right	0.90 $\pm$ 0.05	0.18 $\pm$ 0.04	11.33 $\pm$ 0.70	12.77 $\pm$ 0.66
	Left	0.90 $\pm$ 0.03	0.18 $\pm$ 0.03	11.69 $\pm$ 0.66	12.42 $\pm$ 0.69
	Means	0.90 $\pm$ 0.03 <sup>a</sup>	0.18 $\pm$ 0.02 <sup>a</sup>	11.51 $\pm$ 0.46 <sup>b</sup>	12.59 $\pm$ 0.46

<sup>a, b</sup>Means within rows showing different superscripts differ significantly at  $P < 0.001$

The total epididymal sperm reserves of the adult bucks in the current study were higher than in the reserves of adult bucks (breed not stated) reported by Jindal and Panda (1980), but were lower than that reported by Ritar (1983). However, the distribution of spermatozoa in the three portions of the epididymis for both the young and adult bucks in the present study agree with the reports of the above workers.

Studies A and B considered together indicate that puberty in Thai native bucks is attained well before 5 months of age and although 5 months old bucks have only about half the sperm reserves of adults, their reserves are possibly adequate for restricted matings or semen collection. However, fertility needs to be evaluated in order to make recommendations on the earliest age Thai native bucks can be used for regular matings or semen collections for artificial insemination.

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