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INTRODUCTION

In recent years, fallow deer farming has gained widespread popularity in Australasia and North America. This has increased the demand and commercial value of the breeding stock, thereby placing an emphasis on the successful and economic application of artificial insemination technology to maximise reproductive activity and rapidly perpetuate desirable performance characteristics in this species. To-date almost all artificial insemination programmes have utilised frozen-thawed spermatozoa, possibly a result of the lack of information on fresh deer semen physiology/biochemistry. This paper is a summary of some of the practices employed in the preservation of fallow deer semen.

Semen collection

Semen from fallow bucks is almost universally collected by electroejaculation. Apart from being time consuming, this technique requires full sedation of the animal. This limits the frequency of semen collection to a maximum of once a week and reduces the quantity and quality of harvested semen. The main contaminants of semen collected by electroejaculation are urine and accessory gland secretions.

Recently, an alternative method of semen collection using an internal artificial vagina (AV) was developed at Ruakura. For semen collection with the AV an ovariectomised doe is treated with progesterone and oestrogen to induce oestrous behaviour and receptivity to the buck. When the female is on heat, the AV is fitted into the doe who is joined with the buck in

the paddock. After mating is observed, the AV is removed and the semen is aspirated and sent to the laboratory for assessment.

The advantages of semen collection with the AV are obvious. Apart from the benefit on the welfare of the animal, semen can be collected more frequently thereby increasing the availability of genetic material from top sires. There is also the possibility of improving the quality of harvested semen.

Semen evaluation

After collection of semen, the quantity and quality of each ejaculate should be carefully assessed before use. It is imperative that semen is handled carefully so that viability of the spermatozoa is not impaired. Ejaculates of fallow bucks vary in quantity and quality. The number of spermatozoa (quantity) in the ejaculate is dependent on the volume and concentration of the semen. The quality characteristics include motility and morphology of the spermatozoa.

i. Volume of semen: The volume of ejaculates from fallow bucks varies between 0.5-1.5 ml. The volume of the semen can be measured by using a pasteur pipette fitted with a turberculin syringe. As the semen sample is drawn into the pipette the volume of air displaced in the syringe is equal to the volume of the semen sample.

ii. Motility of spermatozoa: The motility of spermatozoa can be assessed either by measuring the wave motion characteristic of the semen or estimating the proportion of progressively motile spermatozoa in the sample. For assessment of the wave motion, a drop of semen is placed on a pre-warmed slide ($37^{o}C$) and examined microscopically under low magnification (10x-40x). An estimate of the motility of spermatozoa is made on the basis of the vigour of wave motion. This is usually assessed on a 0-5 scoring system. In principle, semen samples with a wave motion score of 4-5 (containing between 70%-90% motile spermatozoa) can be used for artificial insemination and samples with a score of 3 or less (containing between

65%-0% motile spermatozoa) should be discarded as they may result in reduced fertility.

Estimation of the proportion of progressively motile spermatozoa requires dilution of the semen and microscopic examination under greater magnification (400x). A small drop of the diluted semen is placed on a pre-warmed slide and covered with a cover slip. The proportion of spermatozoa which are progressively motile (characterised by forward motion) is estimated.

iii. Concentration of spermatozoa: Accurate determination of the concentration of the semen sample is very important because the dilution ratio depends on it. Good quality fallow buck semen contains between 2-5 x 10^9 spermatozoa per ml of semen. At Ruakura, the concentration of the semen sample is measured using a spectrophotometer. For fallow buck semen diluted at a standard rate, the amount of light transmitted through the sample is inversely proportional to the number of spermatozoa. This method gives an estimate of the total count of spermatozoa per ml of semen and does not account for the number of dead or immotile spermatozoa.

iv. Morphology of spermatozoa: At the beginning of the semen collection season, semen samples from individual bucks should be examined for the morphological appearance of spermatozoa. Abnormal spermatozoa are detected in smears prepared and stained (using eosin-nigrosin stain) on a microscopic slide. Semen samples with a high proportion of abnormal spermatozoa (greater than 10%) should be discarded as they are expected to result in reduced fertility.

Semen handling

After the semen quality is assessed, the dilution rate (i.e. the amount of diluent to be added to the semen sample) is determined. This is dependent on the total number of spermatozoa in the semen sample (calculated by multiplying the volume and concentration of spermatozoa) and the number of spermatozoa to be loaded into the straws (at Ruakura, 50 x