Current Review of Artificial Insemination in Dogs

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KEYWORDS

• Transcervical • TCI • Norwegian catheter • Artificial insemination • Bitch
• Breeding management

KEY POINTS

- Poor timing of breeding/insemination is the most common cause for failed pregnancy.
- There is no one good test for staging a bitch's cycle; a combination of tests needs to be used.
- A minimum of 150 to 200 $\times$ 10^6 live normal sperm are recommended for insemination.
- Transcervical insemination has a higher pregnancy rate than vaginal insemination with fresh semen.
- Transcervical insemination has a higher pregnancy rate than laparotomy insemination with frozen semen.

INTRODUCTION

Artificial insemination (AI) is the collection of semen from the male and the subsequent insertion of the collected semen into the female. AI in dogs has come a long way since the first successfully reported vaginal insemination with fresh semen performed by Fr Abbé Lazzaro Spallanzani in Italy, in 1780, resulting in the birth of 3 puppies.[1] From fresh semen inseminations wherein breeders are unable to achieve a natural mating, through to the international movement and insemination of frozen thawed semen, knowledge and technologies of both bitch timing techniques and insemination techniques have undergone dramatic change.

AIs may be requested for several reasons, including request of breeder, failure to achieve a successful mating (including slip matings), inability to achieve a mating (conformational), or due to the use of fresh chilled or frozen semen. A successful natural mating requires full intromission of the dogs' penis into the vagina, with the bulb of the penis being locked into the vagina by the cingulum. The male must turn by lifting one hind leg over the rump of the bitch with the penis locked in the vagina, resulting in both animals facing away from each other in the 'tie' position. The animals must

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remain tied for a minimum of 10 minutes in order to achieve a successful breeding with maximal pregnancy rates, with anything less than 10 minutes being termed a slip-mating.[2] Slip matings are commonly the result of an *outside tie* (the bulbus glandis engorges outside the vulva). Conception rates of *outside tie* breeding may be improved by elevating the hind quarters of the bitch for 5 minutes.[3] It is during the tie that large volumes of prostate fluid are deposited into the bitches vagina/uterus, which due to being instilled after the semen-rich fraction, is thought to aid in the passage of sperm to the oviduct of the female for fertilization.[4]

For an AI to be most successful it is important that the procedure be performed at the appropriate stage of the bitches' cycle, that semen of adequate quality is used, and that the procedure is performed appropriately with a good understanding of the success rates of the different insemination procedures.

Five forms of insemination of the bitch have been described, with only the first 4 being commonly performed today:

1. Vaginal insemination
2. Endoscope-assisted transcervical insemination (EIU)
3. Non-EIU (Norwegian catheter)
4. Laparotomy insemination (surgical insemination, surgical implant)
5. Laparoscopic insemination

BREEDING MANAGEMENT AND TIMING OF INSEMINATION

Ovarian Endocrinology Summary

A good understanding of the cycle of the bitch is imperative for maximizing pregnancy rates, as poor timing of insemination is the most common cause of pregnancy failure in the bitch.[3] Bitches spontaneously ovulate; ovulating a primary oocyte arrested in prophase I of the second stage of meiosis.[5,6] The developing follicles (which secrete estrogen) on the ovary of the bitch undergo preluteinization after the preovulatory luteinizing hormone (LH) surge, which occurs approximately 2 days before ovulation.[7,8] The LH surge stimulates luteinization of the granulosa cells to secrete progesterone before ovulation, possibly to aid in the resumption of meiosis of the oocytes.[6] After ovulation, 36 to 50 hours after the LH surge, the corpus luteum forms from luteinization of the thecal and granulosa cells. The corpus luteum secretes progesterone, with progesterone being solely responsible for pregnancy maintenance in the bitch. Six days after ovulation the bitch enters into diestrus.[9] Bitches are unique in that there is no maternal recognition of pregnancy; all bitches have an obligatory diestrus period of 9 to 10 weeks. Following regression of the corpus luteum at the end of diestrus, the bitch enters a phase of hormonal quiescence (anestrus). At the end of the anestrus period (3 or more months), there is an increase in follicle stimulating hormone and LH, which is responsible for the induction of the next estrous (heat) period.

Laboratory Tests for Staging the Bitches Cycle

Luteinizing hormone assay

LH may be measured by a quantitative or qualitative assays. LH levels will remain undetectable until the point of the LH surge. Unfortunately the LH surge length is quite varied in the bitch (24–60 hours), so daily serum analysis is required to detect the LH surge. There is an increasing phase of up to 12 to 24 hours and then a decline over 12 to 36 hours.[10] Qualitative LH tests are the only tests readily available today, and give a positive result greater than 1 ng/mL. Because the LH levels vary (4–14 ng/mL[10,11]) at the peak of the LH surge, coupled with slow increase and