The use of protective AI cover sheaths improved fertility in lactating dairy cows
Gustavo M. Schuenemann,a Santiago Bas,a Armando Hoet,a Eric Gordon,a Donald Sanders,a Klibs N. Galvão,b and Päivi Rajala-Schultza

aDepartment of Veterinary Preventive Medicine, College of Veterinary Medicine, The Ohio State University, Columbus, OH; bDepartment of Large Animal Clinical Sciences, College of Veterinary Medicine, University of Florida, Gainesville, FL

Abstract
The objectives of this study were to evaluate the effectiveness of using a disposable sheath protector (SP) on top of the regular artificial insemination (AI) sheath to minimize contamination of the AI gun and to assess pregnancies per AI (PAI) in lactating dairy cattle inseminated with or without the use of SP. Services (n = 2843) during spring (67%) and summer (33%) from lactating Holstein cows in three commercial herds were included in this study. Animals were presynchronized with two injections of prostaglandin F₂α (PGF) given 14 d apart (starting at 26 ± 3 DIM) followed by Ovsynch (gonadotropin releasing hormone [GnRH]-7d-PG-56 h-GnRH-16 h-timed AI) or Cosynch (GnRH-7d-PG-72 h-GnRH+timed AI) 12 d later. At the time of AI, services were randomly assigned to 1 of the 2 groups: 1) with (TRT; n = 1405) or 2) without (CON; n = 1438) the use of SP. Sterile cotton swab samples were collected from the tip of the AI gun (n = 102) immediately after AI (from TRT and CON) for bacteriology. Pregnancy diagnosis was determined by ultrasonography 40 ± 5 d after AI. Swab samples revealed that the use of SP was effective in minimizing contamination of the AI gun at the time of AI in TRT (51.9%) compared with CON cows (98%; P < 0.05). Overall, PAI was greater (P = 0.01) for cows in TRT (30.1 ± 1.7%) than in CON (25.4 ± 1.9%). Results from this study suggested that the use of SP reduced contamination of the AI gun at the time of AI and improved PAI in lactating dairy cows.

Keywords: dairy cattle fertility, AI, sheath protectors

Introduction
Reproductive efficiency is a major factor for profitability in dairy herds. Artificial insemination is the most common practice used to breed dairy cows in the United States, accounting for approximately 78% of all services.1 Accurate animal identification, semen handling, hygiene of the AI procedure, and site of semen deposition are paramount to achieve acceptable reproductive outcomes over time.2,3 Inseminators should review the AI procedure on a regular basis (e.g., monthly) as well as their reproductive performance over time. Although the AI procedure (i.e., hygiene and site of semen deposition) is often overlooked, an appropriate and clean AI technique is recommended to optimize reproductive outcomes in dairy cows.

Protective AI cover sheaths, a rigid polyvinyl chloride tube of 30 cm in length x 0.7 cm in diameter, were developed to prevent vaginal contamination of the AI gun at the time of AI with the aim of improving reproductive outcomes.4,5 The presence of manure around the perineum (i.e., vulva) is common at the time of AI in lactating dairy cows. The contact of the tip of the AI gun with manure present on the vulvar skin must be avoided to reduce the likelihood of introducing external contaminants (e.g., E. coli) into the uterine lumen at the time of AI. The effectiveness of using SP (on top of the regular AI sheaths) at the time of AI on PAI was evaluated in three commercial dairy herds. The objectives of this study were to: 1) evaluate the effectiveness of using disposable protective SP to minimize vaginal contamination of the AI gun at the time of AI, and 2) assess PAI in lactating dairy cows inseminated with or without the use of disposable protective SP.
Materials and methods

Lactating cows (primiparous = 1158 and multiparous = 1062) housed in free-stall barns from three commercial dairy farms were used in this study. All cows were presynchronized with two injections of PGF given 14 days apart (starting at 26 ± 3 days postpartum) followed by Ovsynch (OV; GnRH-7 d-PGF2α-56 h-GnRH-16 h-timed-AI[TAI]) 12 days later. Cows presenting signs of standing heat any time during the protocol received AI, whereas the remaining animals were subjected to TAI 16 hours after second OV GnRH. At the time of AI, 2843 services from lactating dairy cows were randomly assigned to 1 of the 2 groups; with (TRT, n = 1405) or without (CON, n = 1438) the use of SP. In the TRT group, the AI gun protected with a SP was introduced into the vagina; once in the cranial portion of the vagina adjacent to the cervical os, the SP was pulled back and only the AI gun was manipulated through the cervix into the uterine body for semen deposition. In the CON group, cows received AI without the use of SP. Furthermore, sterile cotton swab samples were taken from the tip of the AI gun (n = 102) after AI from both the treatment and control groups for bacterial culture. Pregnancy diagnosis was determined by ultrasonography 39 ± 3 days after AI. Data analyses were performed using GLIMMIX (PAI) and FREQ (culture) procedures of SAS.

Results and discussion

Cultured swab samples revealed that the use of SP was effective in minimizing contamination of the AI gun (positive bacterial growth; TRT = 51.9% vs. CON = 98.2%; p= 0.05). The most common bacteria isolated (49%) at the time of AI was *E. coli*.3 Regarding the bacterial density growth, the majority (67%) of the samples from the TRT group (AI with the use of SP) had light or sparse bacterial growth compared with the CON group (AI without SP); in which the majority of the samples showed heavy colony growth (71%).3 Although the potential detrimental effects of introduced bacteria into the bovine uterus at the time of AI has not yet been reported, the bacteria may colonize the uterine lining and trigger an inflammatory response as shown in mares (postbreeding subclinical endometritis).7,8 At the time of AI, not only semen but also bacteria and debris can be introduced into the uterine lumen and lead to chronic inflammation and decreased fertility in mares.8 Under normal uterine conditions this physiological immune reaction, described as postmating inflammatory response, is cleared within 48 hours.7,9,10 In lactating dairy cows, the proportion of polymorphonuclear neutrophils (>15%) immediately before and four hours post-AI were associated with poor reproductive performance.11,12 Previous studies (using the same SP as this study) reported no improvement in conception to first services in dairy cattle.4,5 These studies were conducted more than 20 years ago, using several AI technicians (and weekly randomization of SP), and only non-return rates to first service were evaluated. The effectiveness of SP (assigned to every other cow) at the time of AI in one commercial dairy herd using one AI technician and the same reproductive management was investigated.3 Lactating dairy cows that were AI with the use of SP had greater proportion of PAI compared to cows AI without the use of SP.3 Furthermore, in this field study the proportion of cows pregnant (all services; summer and spring from three dairy herds) was greater for cows in TRT (30.1 ± 1.7%) compared with CON group (25.4 ± 1.9%). According to these findings, lactating dairy cows may benefit from the use of SP at the time of AI by reducing the potential introduction of external contaminants such as *E. coli* (e.g., from perineum or vaginal origin) into the uterine lumen at the time of AI. In conclusion, these results suggest that the use of SP at the time of AI reduced contamination of the AI gun and improved PAI in lactating dairy cows. Performing a clean AI technique through the use of SP may be an effective strategy to improve reproductive outcomes in dairy cattle. Cleanliness of the whole AI procedure must become a top priority for professional AI technicians and on-farm breeders to achieve consistent reproductive results over time.

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References


