

Comparing Bovine Semen Frozen in 1/4 and 1/2 ml Straws

Introduction

Semen throughout the world has been frozen in two sizes of plastic straws for the last 30 to 40 years. During this time continuous research has developed freezing procedures that have enhanced the quality of semen in both sizes of straws. Each of these straw sizes has some advantages and disadvantages. In the USA semen has been mainly packaged in 1/2 ml straws. The objective of this study was to more thoroughly study and validate differences in on-farm conception rates between semen frozen in 1/4 and 1/2 ml straws using ABS's unique semen processing and freezing methods and then inseminated in large commercial U.S. dairies.

Design and methods used

Semen was collected from eight bulls and processed using a split collection technique assuring that the exact same semen went into each package. Extensions were made so that each straw had exactly the same number of total spermatozoa in each package. The semen was then frozen in a computerized wind tunnel freezer that had been developed by ABS. The semen was then distributed for use in eight commercial dairies by six professional technicians and one on-farm technician. For each bull chosen, the same number of units (200-250 units) of each straw type were placed on the dairy. The technicians used one straw size on even days and the other on odd days of the month. The semen was thawed in 35 to 37 C water for 30 seconds prior to removal. Data was recorded into Dairy Comp 305. Pregnancy diagnosis by rectal palpation was made on the regular schedule of the dairy at approximately 35 days. Completion of inseminations varied among herds with a range of 2 to 9 months.

Results

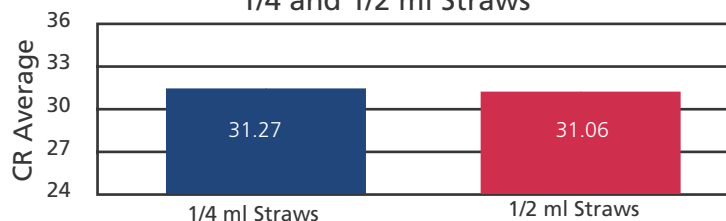
Data was received for 3229 and 3373 inseminations with mean conception rates of 31.27% and 31.06% using semen packaged in 1/4 and 1/2 ml straws respectively (Figure 1). The difference in conception rate was not significant ($P>0.05$).

Discussion

ABS has been packaging semen in both the 1/4 and 1/2 ml straws for over 30 years. During that time continuous research has developed freezing procedures that have enhanced the quality of semen packaged in both 1/4 and 1/2 ml straws. The development of a computerized wind tunnel freezing process has produced consistent, high quality semen freezing results regardless of the straw size. The results of this trial indicate that when the same number of spermatozoa are frozen using this procedure there is no difference in the fertilizing capacity of semen frozen in either package.

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Figure 1:
Average Conception Rate for Semen Frozen in 1/4 and 1/2 ml Straws



Additional information

This field trial was not designed to evaluate differences among technicians or herds because neither used all bulls in the study. However, some interesting within technician or bull comparisons might be worth looking at to get a better understanding of how normal binomial variation can influence results. Figure 2 shows the variation in conception rate when the same collection of semen from a bull was used in different herds by different inseminators. Note that within each bull comparison there were times that semen packaged in the 1/4 ml straw had a little higher mean conception than semen in the 1/2 ml straws and others when it was reversed.

Variation was also observed in technician results within bull semen package where the technician had used more than one bull (Figure 3). Note in Figure 3 that a technician conception rate appears to be higher when semen from the 1/4 ml straws were used for one bull and the results were reversed when another bull was used.

While this study can not conclusively establish if there are differences in how technicians, bulls or herds might affect fertility results when semen is frozen in either package, we can find no trends (Figures 2 & 3) that would indicate a preference of one package over another. The results shown in Figures 2 and 3 both point out the problem of analyzing fertility data with a small number of observations. This variation exists because an insemination either results in the animal becoming pregnant or not. She never becomes 60% or 75% pregnant. This variation is called binomial variation. Table 1 shows the amounts of binomial variation that can be expected when fertility results are compared after different number of inseminations have been completed. The data in this table clearly show that a large number of inseminations

are needed in order to establish true differences when making reproductive comparisons.

Figure 2:

Conception Rates for Bulls Used in Multiple Herds With the Exact Same Semen

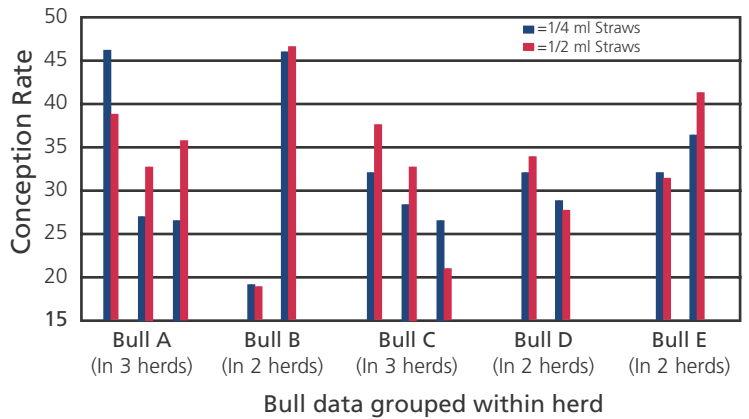


Table 1: How numbers of inseminations affect fertility estimation.

Number of Inseminations	95% Confidence Interval*
10	±29.0
50	±13.0
100	±9.2
300	±5.3
500	±4.1
1000	±2.9
5000	±1.3
10000	±0.9

* The values assume that all of the error variance is due to binomial distribution

Figure 3:

By bull, conception rate of semen frozen in 1/4 ml straws minus conception rate of semen frozen in 1/2 ml straws

