BIOLOGICAL VARIABILITY AND CHANCES OF ERROR

Variability among individual animals in an experiment leads to problems in interpreting the results. Animals on treatment X may have higher average daily gains than those on treatment Y, but variability within treatments may indicate that the differences in production between X and Y were not the result of the treatment alone. Statistical analysis allows us to calculate the probability that such differences are from treatment rather than from chance.

In some of the articles herein, you will see the notation "P<0.05." That means the probability of the differences resulting from chance is less than 5%. If two averages are said to be "significantly different," the probability is less than 5% that the difference is from chance or the probability exceeds 95% that the difference resulted from the treatments applied.

Some papers report correlations or measures of the relationship between traits. The relationship may be positive (both traits tend to get larger or smaller together) or negative (as one trait gets larger, the other gets smaller). A perfect correlation is one (+1 or -1). If there is no relationship, the correlation is zero.

In other papers, you may see an average given as 2.5 ± 0.1. The 2.5 is the average; 0.1 is the "standard error." The standard error is calculated to be 68% certain that the real average (with unlimited number of animals) would fall within one standard error from the average, in this case between 2.4 and 2.6.

Many animals per treatment, replicating treatments several times, and using uniform animals increase the probability of finding real differences when they exist. Statistical analysis allows more valid interpretation of the results, regardless of the number of animals. In all the research reported herein, statistical analyses are included to increase the confidence you can place in the results.

A REVIEW OF OXYTOCIN USE FOR SOWS AND GILTS

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Summary

Oxytocin is frequently used to decrease farrowing time and birth interval as an aid to prevent stillbirths, but recent research has shown that oxytocin use can increase the number of pigs stillborn when used too early in the birth process. The research indicated that the reason for increased stillbirths was an increased number of ruptured umbilical cords, leading to compromise of the pigs' oxygen supply during the birth process. Oxytocin usage should be limited to older-parity sows and the last half of the birth order.

(Key Words: Oxytocin, Stillbirth, Farrowing.)

Introduction

Swine producers use oxytocin to shorten farrowing time and the interval between each pig born. A 1995 National Animal Health Monitoring System (NAHMS) study indicates that 8.2% of swine producers administer oxytocin to all sows farrowed. Oxytocin is a hormone produced in the hypothalamus and excreted by the pituitary gland. It has numerous functions, but the two most known are for the milk letdown reflex and for stimulation of uterine contractions. Oxytocin stimulation of uterine contractions will decrease the interval between piglet births, and is used on many farms as an intervention to reduce stillbirths and aid in the farrowing process. But administering oxytocin before the cervix is fully dilated or the first pig is born can lead to dystocia or difficult birth. Improper oxytocin use can also cause an increased number of stillbirths by causing ruptured umbilical cords that lead to decreased oxygen delivery to the piglet during birth.

Discussion

A stillbirth is defined as a piglet that is normally developed but dies shortly after or during parturition and does not breath. Stillbirth numbers are typically higher in older-parity sows, and generally occur later in the birth order. In one study, for example, 75% of stillbirths were recorded after the 8th pig was born when sows were allowed to farrow without intervention. In contrast, this same study indicated that 88% of stillbirths were recorded before the 5th pig was born when sows were administered a single dose of oxytocin after the first pig was born.

An evaluation of the risk factors for stillbirths on two commercial swine farms in Brazil indicated that use of oxytocin increased the risk for stillbirth. A total of 101 litters were evaluated from the first farm, and 373 litters were evaluated on the second farm. The data indicated that the percentage of litters with one or more stillbirths was increased on each of the farms when oxytocin was given to the sow some time during the birth process (Figure 1).

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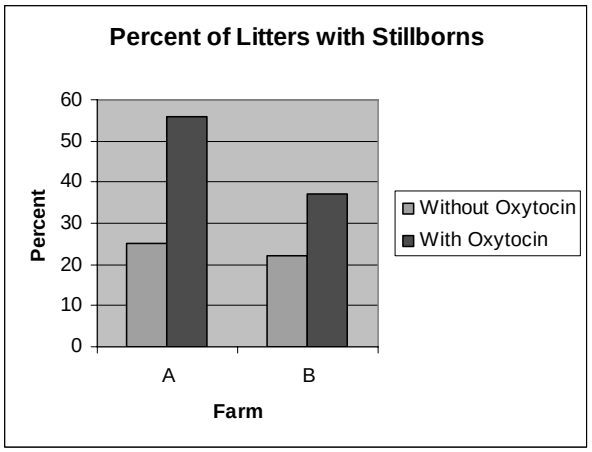

Figure 1. Percentage of Litters from Two Farms with or without Oxytocin Administration. (Adapted from Lucia, T. et al. 2002. Prev. Vet. Med. 53:285-292.)

Data from a prospective study indicated that stillbirths per litter were significantly increased after the administration of a single dose of oxytocin (Table 1). The control sows were allowed to farrow without intervention. The oxytocin group is the mean of two different oxytocin sources; the sows were administered a single dose of oxytocin after the first pig had been born. All births were attended, and the pigs were classified as live or stillborn. Presence of meconium staining and umbilical cord hemorrhage also were evaluated. Meconium staining is an indicator of inspiratory effort, either in the uterus or birth canal, when the piglet has low levels of blood oxygen.

As expected, the total farrowing time and interval between piglet births was reduced in sows administered oxytocin (Table 1). But the numbers of intrapartum stillborn deaths and ruptured umbilical cords per litter were significantly greater among the sows treated with oxytocin than among the control sows. Also, severe meconium staining was more prevalent in live-born and stillborn pigs born of treated sows. Meconium staining is a good indicator that the piglets are oxygen deprived. The study suggests that oxytocin administration was causing umbilical cord injury that compromised delivery of oxygen to the piglet during the birth process, which caused stillbirth deaths.

Although improper use of oxytocin has potentially negative implications, it also can be beneficial to the farrowing process to stimulate uterine contractions and prevent stillbirths in older sows. The recommended dosage is ½ cc (10 IU) to stimulate uterine contraction. Larger doses frequently are used, but larger doses will not improve the efficiency of oxytocin usage. The following are further recommendations for properly using oxytocin:

- Administer oxytocin only after the cervix is fully dilated
- Limit usage in gilt litters
- For a normally farrowing sow, do not use oxytocin until a minimum of 6 pigs have been born
- Use oxytocin when a sow has not had a piglet for more than 40 minutes
- Only use a maximum of two doses per sow

Oxytocin should not be used as a substitute for obstetrical assistance. Indicators of need for obstetrical assistance are bloody discharge from the vulva, no piglets born in at least 40 minutes, obvious pain or straining, or a history of stillbirths.

Table 1. Farrowing Variables of Saline Solution-treated (Control) and Oxytocin-treated Sows[a]

	Sow Group[b]	
Variables	Control	Oxytocin
Farrowing time, min	316.68 ± 9.70	170.145 ± 4.71
Interval between piglet births, min	28.54 ± 0.63	14.37 ± 0.36
Intrapartum stillbirths per litter	0.73 ± 0.13	1.16 ± 0.1
Ruptured umbilical cords per litter	0.15 ± 0.05	0.64 ± 0.095
Inspiratory effort, stillbirths per litter	0.35 ± 0.08	0.05 ± 0.015
Detectable heart rate, stillbirths per litter	0.50 ± 0.10	0.12 ± 0.04

[a]Adapted from D. Mota-Rojas et al., 2002. American Journal of Veterinarian Research 63:1571-1574.

[b]The control sows were allowed to farrow without intervention. The oxytocin group is the mean of two different oxytocin sources when the sows were administered a single dose of oxytocin after the first pig had been born.