ANALYSIS OF THE CELLULAR COMPONENTS OF SWINE COLOSTRUM AND MILK

JANET A. WEBER and FREDERICK G. FERGUSON
DEPARTMENT OF VETERINARY SCIENCE
THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK, PENNSYLVANIA, U.S.A.

Introduction

Research on mastitis in swine has been focused on determining the causes for hypogalactia or agalactia occurring when the sow farrows. This interest results from the role MMA plays in piglet losses. Only mastitis and agalactia have been shown to be associated, with bacterial infection being the most likely cause of mastitis and therefore of agalactia. Field studies have detailed the causes for mastitis and clinical studies have to some degree reproduced mastitis experimentally, but little information is available on normal mammary gland secretions in swine.

Methods and Materials

The present study followed 6 Yorkshire sows from parturition to 22 days post partum (weaning at 21 days). Attention centered on somatic cell counts (cells/ml), differential counts, and bacterial cultures (colony forming units/ml or CFU/ml). Two of the 6 sows were multiparous; the other 4 had had a previous litter by Caesarean delivery. Some samples at selected timepoints were taken from 4 additional multiparous sows. The sample times were at parturition (0), and 3, 5, 8, 10, 12, 15, 17, 19, and 22 days post partum. (Number of glands sampled = n)

Samples were collected by hand milking the sows after cleaning the teats with 70% ethanol. The initial secretions, approximately one milliliter, of each mammary gland were used. Thirty units intramuscularly or 10 units intravenously of oxytocin were used to stimulate milk letdown. A comparison of samples taken with and without oxytocin indicated that oxytocin does not affect cell counts or differentials under the sampling procedure outlined above.

Somatic cell counts were performed using a direct microscopic counting method. Differential counts were performed from slides made from each sample. Determination of CFU/ml was made by plating serial dilutions of each sample in nutrient agar. This presentation does not include all of the data collected in this study.

Results

Table 1 summarizes the data on somatic cell counts. Cell counts were lowest at parturition then increased to a fairly stable concentration for the remainder of lactation. Fluctuations in CFU/ml or in differential counts were not reflected in changes in somatic counts.

Table 1. Comparison of Somatic Cell Counts in Sows at Different Days of Lactation

Time	n	Somatic Cells x 10^5/ml ± S.E.
0	51	5.73 ± 1.29
3	27	44.80 ± 18.30
5	16	63.10 ± 29.00
8	29	54.30 ± 12.40
10	16	58.10 ± 11.00
12	15	58.80 ± 8.59
15	10	25.70 ± 5.95
17	7	35.60 ± 8.34
19	10	64.10 ± 18.20
22	11	23.20 ± 8.53

Differential counts (Table 2) indicate the predominant cell at parturition and during lactation is the neutrophil. Beginning at 15 days post partum there is a tendency for the percentage of neutrophils to decrease while the percentages of monocytes and lymphocytes increases. For neutrophils the drop was from a range of 78 to 92% to one of 53 to 84%, while the increase for monocytes was from 5 to 16% to a range of 14 to 43%. The increase in lymphocytes was slight but consistent. Changes in the size of the lymphocyte population did not produce a discernible pattern in the proportion of T-cells present. This trend was reversed at weaning.

Table 2. Differential Counts of Mammary Gland Cells of Sows (Percent ± S.E.)

Time	n	Lymphocytes	Monocytes	Neutrophils
0	51	0.40±0.19	7.54± 1.23	80.70± 2.01
3	27	0.31±0.16	6.80± 1.06	86.30± 1.74
5	16	0.47±0.17	10.13± 2.40	85.99± 2.44
8	29	0.38±0.12	12.90± 3.03	83.45± 3.25
10	16	0.25±0.11	7.84± 1.64	89.44± 1.98
12	15	0.00	5.83± 0.76	91.33± 1.14
15	18	0.10±0.10	6.50± 1.70	90.80± 2.18
17	7	0.29±0.18	18.93± 4.28	79.86± 4.56
19	10	0.45±0.22	33.25±10.90	64.25±10.92
22	11	0.32±0.14	3.55± 0.91	90.77± 1.17

Very little change was seen in the number of bacteria present in colostrum or milk although the lowest CFU/ml value occurred at parturition. As mentioned previously, fluctuations in CFU/ml did not result in fluctuations in either somatic cell count or in the differential count.

Table 3. Presence of Bacteria in Sow Colostrum/Milk during Lactation

Time	n	Colony Forming Units x 10^3 per ml ± S.E.
0	31	4.02 ± 1.25
3	19	55.50 ± 20.80
5	13	38.70 ± 13.00
8	32	11.40 ± 2.35
10	21	13.70 ± 4.74
12	15	9.87 ± 2.51
15	18	7.87 ± 3.03
17	15	21.30 ± 13.30
19	18	63.20 ± 26.30
22	13	108.00 ± 27.00

Summary

The results of this study show that the profile for mammary gland secretions in swine differs from that of other species. In cattle, cell numbers are highest before parturition and the predominant cell during lactation in the absence of mastitis is the monocyte (McDonald and Anderson, 1981). Examination of milk samples from lactating women shows a similar decreasing trend in cell numbers but the lymphocyte and T-cell populations though variable are large (Ogra and Ogra, 1978; Crago et al., 1979). In swine the trend in cell numbers is the reverse, neutrophils predominate, and lymphocytes are consistently present in low numbers.

Of particular interest is the difference in differential counts which indicates a low level of infection may be continually present and tolerated in the normally functioning mammary gland. The large neutrophil population may also be a continued inflammatory response to injury by nursing piglets. Table 2 suggests a trend in monocyte and neutrophil numbers which may reflect an increasing reliance on solid food before weaning. Values obtained in this study were consistently within or below the range of values reported in a study by Ross et al. (1981), despite differences in techniques. Both studies indicate it is not possible to characterize a particular gland as mastitic solely on the basis of somatic cell counts.

References: Crago et al., Clin.Exp.Imm.(1979)v.38: 585; McDonald, J.S. and Anderson, A.J., Am.J.Vet.Res. (1981)v.42,no.8:1366; Ogra, S.S. and Ogra, P.L., J.of Pediatrics (1978) v.92,no.4:550; Ross et al., Am.J. Vet.Res.(1981)v.42,no.6:949.