Types and doses of injectable medications given to periparturient sows

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Objective—To determine types and doses of injectable medications given to periparturient sows and reasons for administering those medications, and to compare medication practices among farms of different sizes.

Design—Survey.

Sample Population—301 farms; 231,016 periparturient sows.

Procedure—A survey was used to obtain information regarding medications given to sows during the farrowing period. State and federal veterinary medical officers completed surveys during their final interview with producers who had participated in the National Animal Health Monitoring System’s (NAHMS) Swine 95 study. Data were summarized and treatment regimens compared among farms of different sizes.

Results—More than a third of the sows received medications during the farrowing period. The most common reasons for administering medications were routine preventive treatment and treatment of dystocia, uterine discharge, and poor appetite. The most commonly used medications for treatment of sick sows were oxytocin, procaine penicillin G, and B vitamins. A high percentage of medications were either not indicated for the specific condition or used at greater or less than the approved dose. In general, treatment rates and medications used did not differ among farms of different sizes.

Conclusions and Clinical Relevance—Better treatment protocols are needed to provide more appropriate treatment of sick sows. (J Am Vet Med Assoc 2000;216:510–515)

Many decisions made by swine producers have ramifications for the end product; specifically, the decision to routinely use antibiotics may result in drug residues or transmission of resistant strains of bacteria through the food chain. Food safety has become a major public concern in the 1990s and has been identified by the National Pork Producers Council as the number one issue facing pork producers today. Consumers desire food that is nutritionally wholesome and free from drug residues. Concern for production of residue-free pork and less reliance on antibiotics has caused producers and veterinarians to reevaluate the benefits and risks of antibiotic treatments that are in common use. Antibiotic residues are not only a domestic food safety concern, but they also affect a meat processor’s ability to export pork, particularly to European and Asian markets.

Results of the 1990 National Animal Health Monitoring System (NAHMS) survey indicated that medication of sows during the farrowing period is a common practice among swine producers. A fourth of sows that farrowed during the 3 months of that study received an injection of antibiotics, and 16% of producers reported that they routinely gave antibiotics to sows around the time of farrowing as a preventive practice. A follow-up study completed by NAHMS in 1995 reported that the percentage of producers that routinely gave antibiotic injections to all sows at the time of farrowing increased to 30%. Possible explanations for the increase in the routine use of antibiotics may have been the increase in number of producers who used medicated early weaning and the number of herds chronically infected with porcine reproductive and respiratory virus.

Although medication of periparturient sows is a widespread practice among swine producers, the specific drugs and doses used and the reasons for administering those drugs are not understood. The annual removal rate of sows has been reported to be between 35 and 55%. Because approximately a fourth of these sows may have received medications during the farrowing period, there is a considerable risk for introducing residues into the food chain. The purpose of the study presented here was to determine the types and doses of injectable medications given to periparturient sows, the reasons for administering those medications, and to compare medication practices among farms of different sizes.

Materials and Methods

Survey—In cooperation with the NAHMS Swine 95 study, a survey was developed to obtain information regarding medications given to sows during the farrowing period (Appendix). Surveys were completed by state and federal veterinary medical officers who interviewed producers on the final of a series of visits made to the farms between Jul 17, 1995, and Jan 17, 1996.

In the NAHMS Swine 95 study, a multiphase stratified sampling process was used to randomly select 418 swine producers in the top 16 swine-producing states who had ≥ 300 growing pigs (ie, number of nursing to market-age pigs) on Jun 1, 1995. Information on production, management practices, and health conditions were collected during 3 individual, on-farm, face-to-face interviews with each of these 418 producers. Of the 418 producers interviewed, 358 had a farrowing phase and farrowing sows on their farms, and 301 of these 338 (84.1% response rate) producers completed the survey designed to obtain information regarding types and doses of drugs administered to sows in the farrowing house and reasons for using those drugs. Eight disease conditions and a miscellaneous category (ie, other conditions) were list-

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ed on the survey form (Appendix). Only 8 of 301 producers reported using medication for other conditions, and those producers treated <1% of farrowing sows for these conditions. In most cases, the other conditions listed by producers were not a specific disease or condition. Because of the low number of responses for this category, it was not included in data analysis.

**Farm size and facilities**—Producers reported the number of farrowings on their farms during the previous year (ie, 1995). Number of farrowings on all farms was 231,016. Farms were assigned to 1 of the 4 following categories on the basis of the number of farrowings: ≤200 farrowings (small; n = 105), 201 to 500 farrowings (medium; 106), 501 to 2,000 farrowings (large; 62) and ≥2,001 farrowings (very large; 28).

Information on type of farrowing facility was available from data collected in the NAHMS Swine 95 study. Buildings that provided total confinement were the most common type of facility on farms (46.4% of farms; 81.3% of farrowings), followed by open buildings (40.3%; 15.6%). Lots or pastures with a hut or without a building were the least-common types of farrowing facility (13.3%; 3.1%). Therefore, on nearly all farms, producers had ready access to sows at farrowing for diagnosis of illness and administration of medications.

**Determination of number of farrowing sows treated for specific conditions**—Producers estimated the number of sick sows that received injectable medications during the previous year for treatment of the 8 conditions listed on the survey. The maximum number of farrowing sows treated on each farm was calculated as the total number of farrowing sows treated with any medication for any condition, and the minimum number of farrowing sows treated on each farm was calculated as the number of farrowing sows that received different medications. For example, a producer may have reported that 100 farrowing sows received 10 ml of procaine penicillin G for treatment of uterine discharge, 20 received 10 ml of procaine penicillin G for treatment of poor appetite, and 10 received 10 ml of procaine penicillin G and 2 ml of oxytocin for treatment of agalactia. In this herd, sows medicated for poor appetite may have been a subset of sows medicated for uterine discharge and, thus, the same treated sows were reported in 2 categories. Therefore, the minimum number of farrowing sows treated on this farm was 110, and the maximum was 130. The maximum and minimum number of farrowing sows treated on a farm were expressed as a percentage of all farrowings on that farm.

For each drug used to treat sick sows, the number of farms on which these drugs were used, number of farrowing sows that received an injection of each drug, and percentages of doses given that were greater than, less than, or equal to the approved dose were tabulated.

**Statistical analyses**—Descriptive statistics were used to summarize data. Because distribution of number of farrowings/year was skewed to the left, data were log transformed for comparison of drug use among farms of different sizes. After log transformation, inspection of mean, median, and quartiles indicated that data were normally distributed. One-way ANOVA was used to compare frequency of treatment among farms of different size, and number of farrowing sows among herds that were treated with greater than the approved dose, the approved dose, or less than the approved dose. Percentage of producers using a specific medication for treatment were compared among farms of different sizes by use of the χ² test.

**Results**

**Routine administration of medication**—Of the 301 producers surveyed, 61 (20.2%) routinely administered injectable medication (other than acaricides, prostaglandins, and vaccines) to all sows at the time of farrowing as a preventative measure. There were 38,735 farrowings (16.8% of the total farrowings in the survey) on these 61 farms. Herds in which farrowing sows routinely received medications had 639 farrowings/year (mean), which was not significantly different (P = 0.96) from number of farrowings recorded for herds in which sows did not receive routine medication (801 farrowings/year).

Of the 61 producers that routinely administered medication to all sows at farrowing, 17 (27.9%) gave procaine penicillin G, 13 (21.3%) gave a mastitis-agalactia (MMA) mixture, 11 (18.0%) gave procaine penicillin G and oxytocin, 5 (8.2%) gave oxytocin, 4 (6.5%) gave oxytetracycline, 2 (3.3%) gave procaine penicillin G, oxytocin, and vitamin B, and 2 (3.3%) gave oxytocin and a combination product (dexamethasone, chlorpheniramine maleate, dihydrostreptomycin, and procaine penicillin G). The remaining 7 (11.5%) producers gave either benzathine penicillin, procaine penicillin G and tylosin, vitamin E and selenium, procaine penicillin G and oxytetracycline, oxytocin and tylosin, oxytocin and benzathine penicillin, or oxytocin, dipyrone, and dexamethasone.

Producers that routinely administered injectable medication to all sows at the time of farrowing also treated sows for specific diseases or conditions. However, maximum percentage of farrowing sows treated for specific conditions in these herds (32.3%) did not significantly (P = 0.14) differ from that in herds where sows did not routinely receive medications (26.9%).

**Total number of treated farrowings**—In the 61 herds in which sows routinely received medication at the time of farrowing, there were 38,735 sows that farrowed and received a routine treatment; 12,589 of these farrowing sows were also treated for a specific disease or condition. There were 192,281 farrowing sows in the 240 herds in which sows did not routinely receive medications, and 51,724 of these sows received medication for treatment of specific diseases. Overall, 90,459 of the 231,016 (39.2%) farrowing sows received injectable medication.

**Treatment of specific conditions**—Mean (±SD) maximum percentage of farrowing sows treated with any drug for any condition in all 301 herds was 28.1 ± 26.2%, and mean minimum percentage of farrowing sows treated was 22.9 ± 23.4%. Percentage of farrowing sows treated for disease varied greatly among herds. In 16 of 301 (5.3%) herds, 0% of farrowing sows were treated; in 73 (25.0%) herds, 1 to 10% of farrowing sows were treated; in 71 (25.7%) herds, 11 to 20% of farrowing sows were treated; in 66 (22.0%) herds, 21 to 40% of farrowing sows were treated; in 38 (12.7%) herds, 41 to 60% of farrowing sows were treated; and in 35 (11.5%) herds, 61 to 100% of farrowing sows were treated. Maximum and minimum percentage of farrowing sows treated for specific conditions did not differ significantly (P = 0.72 and 0.70, respectively) among farms of different sizes (small farms, maximum = 29.5% and minimum = 22.6%; medium farms, 25.6
and 21.8%; large farms, 23.9 and 23.2%; very large farms, 29.0 and 27.8%.

Percentage of farrowing sows treated for 7 of the 8 specific conditions listed in the survey did not differ among farms of different sizes. However, percentage of farrowing sows treated because of savaging increased as farm size increased (Table 1).

Producers identified a veterinarian as the source of information regarding type and dose of medications used for 977 of 1,098 (89.0%) treatment protocols.

Feed dealers were identified as the source of information for 19 of 1,098 (1.8%) treatment protocols, extension personnel for 6 of 1,098 (0.5%) treatment protocols, and other (usually self) for 95 of 1,098 (8.7%) treatment protocols.

Drugs most commonly used to treat sick sows—The most common medications used to treat specific conditions were oxytocin (250/301 farms; 83.1%), procaine penicillin G (192/301; 63.8%); and B vitamins (68/301; 22.6%; Table 2).

**Oxytocin**—The approved dose of oxytocin for formulations that contain 20 U of oxytocin/ml is 1.5 to 2.5 ml for IM or SC administration and 0.25 to 1.0 ml for IV injection. All available oxytocin products contain 20 U/ml. Because it was unlikely that producers administered IV injections, the dose for IV administration was not considered during data analysis. Oxytocin was administered to 31,940 (13.8%) farrowing sows on 250 (82.8%) farms. Most producers (n = 226; 90.4%) used only 1 dose regardless of condition treated, but 24 (9.6%) producers used 2 or more doses for different conditions. Of the 31,940 sows treated, 13,734 (43.0%) received 0.25 to 1.0 ml (less than the approved dose), 12,425 (38.9%) received 1.5 to 2.0 ml (approved dose), and 5,781 (18.1%) received 3.0 to 12.0 ml (greater than the approved dose). The farms on which producers treated sows with less than the approved dose were significantly (P = 0.006) larger than the farms on which sows were treated with greater than the approved dose (1,420 farrowings/y vs 593 farrowings/y).

**Procaine penicillin G**—The approved dose for formulations of procaine penicillin G that contain 300,000 U of penicillin/ml is 1.0 ml/100 lb of body weight for IM administration. All available injectable procaine penicillin G products contain 300,000 U/ml. For convenience, we considered body weight of an average sow to be 400 lb and body weight of an average gilt to be 300 lb. Thus, the approved dose of pro-

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**Table 1**—Mean percentage of farrowing sows treated for specific conditions on swine farms of various sizes

<table>
<thead>
<tr>
<th>Farm size*</th>
<th>Small (n = 105)</th>
<th>Medium (n = 106)</th>
<th>Large (n = 62)</th>
<th>Very large (n = 28)</th>
<th>P value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dystocia</td>
<td>8.7</td>
<td>6.5</td>
<td>10.2</td>
<td>14.6</td>
<td>0.06</td>
</tr>
<tr>
<td>Uterine discharge</td>
<td>6.4</td>
<td>7.2</td>
<td>4.6</td>
<td>8.6</td>
<td>0.65</td>
</tr>
<tr>
<td>Poor appetite</td>
<td>3.6</td>
<td>3.5</td>
<td>4.9</td>
<td>7.0</td>
<td>0.10</td>
</tr>
<tr>
<td>Agalactia</td>
<td>2.5</td>
<td>3.8</td>
<td>3.0</td>
<td>3.9</td>
<td>0.68</td>
</tr>
<tr>
<td>Mastitis</td>
<td>4.0</td>
<td>3.1</td>
<td>2.1</td>
<td>3.3</td>
<td>0.35</td>
</tr>
<tr>
<td>Injuries</td>
<td>1.0</td>
<td>2.1</td>
<td>1.5</td>
<td>1.5</td>
<td>0.09</td>
</tr>
<tr>
<td>Savaging</td>
<td>0.1</td>
<td>0.3</td>
<td>0.1</td>
<td>0.6</td>
<td>0.01</td>
</tr>
<tr>
<td>Hyperthermia</td>
<td>0.1</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>0.73</td>
</tr>
</tbody>
</table>

*Small farms had ≤ 200 farrowings/y; medium farms had from 201 to 500 farrowings/y; large farms had from 501 to 2,000 farrowings/y; very large farms had ≥ 2,001 farrowings/y. †Values compared among farms of different sizes by use of one-way ANOVA.

**Table 2**—No. of farms (n = 301) on which farrowing sows (231,016) received injectable medications for treatment of specific conditions

<table>
<thead>
<tr>
<th>Condition treated</th>
<th>Oxytocin</th>
<th>Procaine penicillin G</th>
<th>MMA mixture*</th>
<th>Vitamin B complex</th>
<th>Vitamin B12</th>
<th>Dexamethasone</th>
<th>Oxytetracycline</th>
<th>Acenpromazine</th>
<th>Benzathine penicilllin</th>
<th>Tylosin</th>
<th>Lincosamycin</th>
<th>Pen-streptomycin†</th>
<th>Flumoxime meglumine</th>
<th>Dipyrone</th>
<th>Isoflupredone</th>
<th>Ampicillin</th>
<th>Dex/chlor/strep/pen‡</th>
<th>Vitamins A, D, and E</th>
<th>Calcium/phosphorus</th>
<th>Ceftiofur</th>
<th>Erythromycin</th>
<th>Amoxicillin</th>
<th>Sulfadimethoxine</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of farrowing sows treated</td>
<td>250</td>
<td>31,940</td>
<td>28</td>
<td>80</td>
<td>113</td>
<td>118</td>
<td>40</td>
<td>92</td>
<td>2</td>
<td>10</td>
<td>192</td>
<td>25,866</td>
<td>0</td>
<td>11</td>
<td>16</td>
<td>9</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>45</td>
<td>4,185</td>
<td>3</td>
<td>15</td>
</tr>
</tbody>
</table>

*Mastitis-metritis-agalactia mixture; composition varied across farms. †Product containing procaine penicillin and dihydrostreptomycin. ‡Product containing dexamethasone, chlorpheniramine maleate, dihydrostreptomycin, and procaine penicillin.

NA = Not applicable.
Within the approved range. Administered to the other 4,084 (97.6%) sows were 4,185 sows that were treated, 101 (2.4%) received less only 1 dose was used to treat sows on each farm. Of the B complex was administered to 4,185 (1.8%) farrowing approved doses are between 3 and 20 ml/sow. Vitamin administration to adult swine are 5 to 10 ml (7 products). Therefore, according to label directions, combinations and concentrations of B vitamins are commonly used. Approved doses for available injectable products contain 2 or 4 mg of vitamin B12. Vitamin B12 products were considered together, the percentage of farms with ≤ 200 farrowings/y that used B vitamins was significantly (P = 0.05) less than the percentage of farms with ≥ 2,001 farrowings/y (13.3% vs 34.4%). 

**Dexamethasone**—Dexamethasone is not approved for use in swine, so a label dose is not available. Available injectable products contain 2 or 4 mg of dexamethasone/ml. Producers provided a product name that suggested that all dexamethasone products used to treat sows contained 2 mg of dexamethasone/ml. However, product name may have been incorrectly stated. Dexamethasone was used to treat 2,667 (1.2%) farrowing sows on 39 (12.9%) farms. Regardless of condition, only 1 dose was used to treat sows on each farm. Of the 2,667 sows treated, 135 (5.8%) received 2 to 3 ml, 1,179 (44.2%) received 4 to 6 ml, 1,092 (40.9%) received 8 to 10 ml, 200 (7.5%) received 15 ml, and 41 (1.5%) received an unspecified amount. Producers on larger farms were more likely (P < 0.001) to use dexamethasone than those on smaller farms. Dexamethasone was administered to sows on 4 of 105 (3.8%) small farms, 11 of 106 (10.3%) medium farms, 16 of 62 (25.8%) large farms, and 8 of 28 (28.6%) very large farms. Dose of dexamethasone administered did not differ significantly (P = 0.47) among farms of different sizes.

**Oxytetracycline**—Oxytetracycline products are available in concentrations of 50 mg/ml, 100 mg/ml, and 200 mg/ml. The 200 mg/ml formulation is labeled for use at 3 to 5 mg/lb of body weight; sows that weigh 200 to 400 lb should receive 4.5 to 10.0 ml. Oxytetracycline was administered to 3,062 (1.3%) farrowing sows on 49 (16.3%) farms. On most farms (47 of 48 that reported dose administered; 97.9%), only 1 dose was used to treat sows regardless of condition. Of the producers that used oxytetracycline, 38 specified that they used the formulation containing 200 mg of oxytetracycline/ml to treat 1,988 sows. Of the 1,988 sows that received the formulation containing 200 mg of oxytetracycline/ml, 271 (13.6%) received 5 to 10 ml (label dose), 793 (39.9%) received 11 to 16 ml, 729 (36.7%) received 17 to 20 ml, and 195 (9.8%) received 21 to 40 ml. The percentage of small and very large farms on which the formulation containing 200 mg of oxytetracycline/ml was administered (11/133; 8.3%) was significantly (P < 0.05) less, compared with medium and large farms (27/168; 16.1%).

**Acepromazine**—Acepromazine is not approved for use in swine, so a label dose is not available. All commercially available injectable products contain 10 mg of acepromazine/ml. Acepromazine was administered to 1,117 (0.5%) farrowing sows on 22 (7.3%) farms. Regardless of condition, only 1 dose was used to treat sows on each farm. Of the sows treated, 5 (0.4%) received 1 ml, 791 (70.8%) received 2 or 3 ml, 316 (28.3%) received 4 or 5 ml, and 5 (0.4%) received an unspecified amount.

**Benzathine penicillin**—Benzathine penicillin is not approved for use in swine, so a label dose is not available. All available injectable benzathine penicillin

When vitamin B complex and vitamin B12 products were considered together, the percentage of farms with ≤ 200 farrowings/y that used B vitamins was significantly (P = 0.05) less than the percentage of farms with ≥ 2,001 farrowings/y (13.3% vs 34.4%).

**MMA mixture**—An MMA mixture was administered to 2,695 (1.2%) sows on 45 of the 301 (14.9%) farms. On most farms (37; 82.2%), only 1 dose and 1 formulation were used regardless of the condition treated, but on 8 farms (17.8%), 2 or more doses or formulations were used for treatment of different conditions. The composition of MMA mixtures used on 40 of 45 farms (88.9%) was described; composition varied among farms. Most MMA mixtures contained procaine penicillin G (n = 26) or dexamethasone (23). Oxytetracycline (18) and B vitamins (12) were also commonly included in MMA mixtures. Because the composition of MMA mixtures varied, a comparison of doses administered in MMA mixtures. Because the composition of MMA mixtures varied, a comparison of doses administered was not meaningful. Farms on which MMA mixtures were used were not significantly (P = 0.62) different in size from those on which MMA mixtures were not used.

**Vitamin B complex**—A number of different combinations and concentrations of B vitamins are commercially available. Approved doses for IM or SC administration to adult swine are 5 to 10 ml (7 products), 5 ml/100 lb (4), 1 to 5 ml/100 lb (3), and 3 to 5 ml (3). Therefore, according to label directions, approved doses are between 3 and 20 ml/sow. Vitamin B complex was administered to 4,185 (1.8%) farrowing sows on 51 (16.9%) farms. Regardless of condition, only 1 dose was used to treat sows on each farm. Of the 4,185 sows that were treated, 101 (2.4%) received less than the lowest approved dose (ie, 3 ml), but doses administered to the other 4,084 (97.6%) sows were within the approved range.

**Vitamin B12**—Approved doses for available injectable formulations of vitamin B12 are 0.1 to 0.4 ml (1 product), 0.1 to 0.66 ml (2), 0.1 to 2.0 ml (2), and 1 to 2 ml (3). Therefore, according to label directions, approved doses range from 0.1 to 2.0 ml. Vitamin B12 was administered to 1,373 (0.6%) farrowing sows on 17 (5.6%) farms. Regardless of condition, only 1 dose was used to treat sows on each farm. Of the 1,373 sows treated, 611 (44.5%) received 0.1 to 2 ml (approved dose), 250 (18.2%) received 3 to 5 ml, and 512 (37.3%) received 10 to 12 ml.
products contain 150,000 U of benzathine penicillin/ml and 150,000 U of procaine penicillin/ml. Benzathine penicillin was administered to 843 (0.4%) farrowing sows on 19 (6.3%) farms. Regardless of condition, only 1 dose was used to treat sows on each farm. Of the sows treated, 289 (34.2%) received 5 to 10 ml, 144 (17.1%) received 11 to 20 ml, 30 (3.6%) received 30 ml, and 380 (45.1%) received an unspecified amount.

Tylosin—Tylosin is available in 2 concentrations, but producers that responded to this survey only used the formulation that contained 200 mg of tylosin/ml. The approved dose for this formulation is 1 ml/50 lb, which is equivalent to 6 to 8 ml for a 300 to 400 lb sow. Tylosin was administered to 785 (0.3%) farrowing sows on 19 (0.3%) farms. Regardless of condition, only 1 dose was used to treat sows on each farm. Of the sows treated, 13 (1.7%) received 5 ml, 115 (14.6%) received 6 to 8 ml (label dose), 602 (76.7%) received 10 to 16 ml, 30 (3.8%) received 20 to 26 ml, and 25 (3.2%) received an unspecified amount.

Lincomycin—Lincomycin is available in concentrations of 25 mg/ml, 100 mg/ml, and 300 mg/ml. For sows that weigh between 300 and 460 lb, the approved dose is 5 to 7 ml for the product that contains 300 mg of lincomycin/ml, 15 to 21 ml for the product that contains 100 mg of lincomycin/ml, and 60 to 80 ml for the product that contains 25 mg of lincomycin/ml. Lincomycin was administered to 1,185 (0.5%) farrowing sows on 17 (5.6%) farms. Only 1 dose was used to treat sows on each farm, regardless of condition. Nine producers specifically reported that they used the product containing 300 mg of lincomycin/ml, the other 8 producers did not specify product used. There were 799 sows that were treated by producers that specified the product containing 300 mg of lincomycin/ml. Of these sows, 734 (91.9%) received 5 to 7 ml (label dose), 50 (6.3%) received 10 ml, and 15 (1.8%) received 20 ml. Of the 8 producers that did not specify product used, 1 used 3 ml (lower than any label dose), 3 used 5 to 7 ml, and 4 used 10 ml.

Other medications—Other medications administered to farrowing sows included a product containing a combination of procaine penicillin and dihydrostreptomycin (12 [4.0%] farms; 394 [0.2%] farrowing sows); flunixin meglumine (9 [3.0%]; 247 [0.1%]); dipyrone (11 [3.6%]; 1,593 [0.7%]); isofluoradone (7 [2.3%]; 143 [0.06%]); ampicillin (9 [3.0%]; 336 [0.1%]); a combination product containing dexamethasone, chlorpheniramine maleate, dihydrostreptomycin and procaine penicillin (7 [2.3%]; 2,497 [1.1%]); a combination product containing vitamins A, D3, and E (5 [1.7%]; 182 [0.08%]); a combination product containing calcium and phosphorus (5 [1.7%]; 974 [0.4%]); cefitofur (4 [1.3%]; 82 [0.04%]); erythromycin (3 [1.0%]; 140 [0.06%]); amoxicillin (2 [0.7%]; 220 [0.09%]); and sulfadimethoxine (2 [0.7%]; 6 [0.003%]). The following medications were administered to sick sows on 1 farm each: vitamin K, vitamin C, vitamin E, spectinomycin, gentamicin, prostaglandin F2a, triphenylamine hydrochloride, azaperone, and xylazine.

Discussion

Results of the present study are in agreement with results of earlier studies that indicated that 25 to 30% of sows received injectable medications during the farrowing phase. Results of 2 national studies conducted by NAHMS in 1990 and 1995 revealed a dramatic increase in the routine use of antibiotics as a preventive measure in sows and gilts. Whether this increase in antibiotic use reflected changes in sow morbidity and mortality or sow management is unclear. The present study provides a detailed description of the medications administered to sows on a routine basis and for treatment of specific periparturient conditions. The most common reason that producers administered medication to periparturient sows was for routine preventive purposes; approximately a fifth of producers surveyed treated 17% of the farrowing sows represented in this survey in such a manner.

Percentage of farrowing sows treated for specific conditions varied from farm to farm but averaged around a fourth of all farrowing sows on a farm. Various types of medications were used to combat the 8 most common conditions listed on the survey form. Oxytocin and procaine penicillin G were the most commonly used drugs; 13.8 and 11.2% of farrowing sows received at least 1 injection of each drug, respectively.

Our data also suggest that a considerable percentage of medications that sows receive during the farrowing phase may not be indicated for the specific condition, or the dose administered may be inappropriate. In some cases, medications used to treat sick sows are not indicated for treatment of that condition. For example, most of the drugs used to treat malignant hyperthermia and approximately half the drugs used to treat savaging are not appropriate for treatment of those conditions. Procaine penicillin G was commonly administered to sows with mastitis; however, in sows, mastitis is usually caused by gram-negative organisms. Also, a large percentage of sows on some farms were believed to be sick and received treatment. On 50 of the 301 (16.6%) farms, producers reported that greater than half of all farrowing sows were treated for a specific disease or condition. Because number of treated sows provided by producers was an estimate of sows treated throughout a 1-year period, this number likely represents an ongoing over diagnosis of disease in general, rather than an acute outbreak of disease in the farrowing house.

Increasing farm size was associated only with an increased percentage of farrowing sows treated because of savaging. On larger farms, it may be more likely that someone monitors farrowing sows, and thus, there is a greater opportunity to detect and treat this condition, compared with smaller farms.

Administration of less than or greater than the approved dose of any given medication was common. Only 12% of sows treated with procaine penicillin G, 28% treated with oxytetracycline, and 48% treated with oxytocin received the approved dose. Administration of penicillin at greater than the approved dose is understandable, because the minimum inhibitory concentration of penicillin for many common swine infections is greater than the approved dose. However, administration of antibiotics at greater than or less than the approved dose may result in a greater or lesser efficacy of treatment, respectively.
pathogens is high, but the rationale for administration of oxytocin and oxytetracycline at less or greater than the approved dose is not apparent. Producers on approximately a third of the smaller farms (ie, < 500 farrowings/yr) gave oxytocin at greater than the approved dose. One limitation to the present study was that sow weight was assumed to be between 300 and 400 lb. Some of the sows that were treated may have weighed more or less, and the dose they were given may have been appropriate.

Across farms, administration of individual drugs not approved for use in swine was a common practice. Four percent (9,304/231,016) of sows received injections of unapproved drugs such as dexamethasone, acepromazine, benzathine penicillin, flunixin meglumine, dipyrone, ampicillin, amoxicillin, sulfadimethoxine, gentamicin, or a combination product containing dexamethasone, chlorpheniramine maleate, dihydrostreptomycin, and procaine penicillin. Furthermore, drug compounding is not an approved practice, and yet, an MMA mixture was commonly used to treat specific conditions. In addition, 13 of 61 (21.3%) producers stated that they routinely used MMA mixtures as a preventive treatment.

Another limitation of this study was that producers were asked to estimate the number of sows that they had treated. Numbers provided may have been over- or underestimations of the actual number of sows that received medications. However, prior to data collection, a draft of the survey was completed by producers on 8 farms; we also collected treatment data from information recorded on sow cards in the farrowing room of those 8 farms. Degree of agreement between responses to survey questions and information recorded on sow cards was considered acceptable. A third limitation of the present study was that the survey did not include questions regarding withdrawal times used by producers for the various types and doses of injectable medications administered to sows. Hence, it was not possible to draw inferences from the results of this survey to food safety and residue issues.

This survey was completed prior to January 1999, when all of the major swine slaughter facilities began requiring that producers be certified in the Pork Quality Assurance program sponsored by the National Pork Producers Council. In this 1995 survey of 301 farms, producers on 13 farms routinely administered an MMA mixture at farrowing, and 5.3% of all sick sows that were treated were given unapproved drugs or drug combinations. The results may be different if swine producers were surveyed today. Because swine producers identified a veterinarian as their primary source of information regarding treatment protocols, veterinarians should also take an active role in developing and monitoring such protocols for their clients.

References


Appendix

Survey on treatments given to farrowing sows

<table>
<thead>
<tr>
<th>Condition</th>
<th>Estimated No. of sows treated per year</th>
<th>Treatment (chemical, generic, or brand name of product)</th>
<th>Amount given (cc [ml])</th>
<th>Who originally suggested treatment?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dystocia: farrowing difficulty, slow farrowing</td>
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<tr>
<td>Uterine discharge: copious, putrid uterine or vaginal discharge after farrowing with sick sow</td>
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<td>Poor appetite: with or without fever</td>
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<td>Agalactia: poor milk production; failure to milk</td>
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<tr>
<td>Malignant hyperthermia: &quot;puffer sow syndrome&quot;</td>
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<tr>
<td>Mastitis: udder infection; hot, red, swollen gland(s)</td>
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<td>Injuries: shoulder ulcer, torn claws, torn teats, etc</td>
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<tr>
<td>Savaging: attacking piglets, &quot;sow hysteria&quot;</td>
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<td>Other: (describe)</td>
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</table>

Do you provide a routine treatment to every sow that farrows as a preventive measure to avoid sows from becoming ill at the time of farrowing?

Yes   No

If yes, what treatment(s) do you routinely give to sows?

Veterinarian   Feed Dealer   Extension Agent   Other

Who told you to do this?