Mean duration of gestation in mares is estimated to be from 340 to 342 days in the Thoroughbred breed; however, mares typically foal within 2 weeks less than or greater than this mean duration. Thus, the normal duration of gestation is from 320 to 362 days. It is difficult to predict the exact date of foaling. In addition, most mares foal late at night or early in the morning, which necessitates devoting many sleepless nights in anticipation of a given mare’s foaling. Therefore, a method that could prove useful in predicting an accurate date and time of foaling or when a preparturient mare is not ready to foal would be quite beneficial.

The associated physical signs that a mare is preparing for birth include the development of an udder filled with milk in the teats, waxing of the teat ends, dripping of milk, change in consistency and appearance of milk from free-flowing white to sticky yellow, sinking of the tail head on either side as the ligaments of the pelvis relax, and relaxation of the vulva lips.1–3 These signs are indicative of foaling, but there is considerable variation in these impending parturition signals among mares, none of which are an accurate means of predicting when a given mare will foal.

Major changes in the electrolyte composition of the preparturient secretions occur as foaling nears. As the mare approaches foaling, concentrations of sodium and chloride ions decrease and concentrations of calcium, potassium, protein, and lactose increase.4,5 The measurement of these electrolyte changes, especially with regard to the calcium concentration, has become widely used as a method to predict foaling in the horse industry.6–9,a This is largely due to the relative accuracy, ease of use, and cost-effectiveness of...
these methods. In humans, it has been reported that not only electrolyte composition but also the pH of milk changes during the lactation period. However, there have been no reports of the change in pH of preparturient mammary gland secretions in mares.

Immunoglobulin G is selectively concentrated in the colostrum during the last 2 weeks of pregnancy at the latest. Colostrometers and Brix refractometers are analytic tools that have been used to predict colostrum IgG concentrations in mares. Although there is a report in which foaling was predicted on the basis of a decrease in the optical density of preparturient mammary gland secretions, the reason for that decrease as the mare approached foaling is unclear. There is a possibility that increasing IgG concentrations in the preparturient mammary gland secretion are related. However, there have been no reports of predicting parturition on the basis of the colostrometer and the Brix refractometer associated with preparturient mammary gland secretions in mares. Use of a Brix refractometer is more precise, more repeatable, and easier for field assessment of IgG concentration for measuring total protein concentration in plasma. However, the range of protein concentrations measured with the common clinical refractometer is more precise, more repeatable, and easier for field assessment of IgG concentration in colostrum, compared with use of a colostrometer. Furthermore, it requires no dilution or syringe or pipette usage and only requires a small sample. It also allows rapid interpretation and is more cost-effective than optical density measurement with a densimeter. Refractometry measures the concentration of dissolved solids in a solution. Protein solutions can refract light, and this property is used for measuring total protein concentration in plasma with a refractometer. However, the range of protein concentrations measured with the common clinical refractometer is not appropriate for colostrum. The Brix refractometer has been shown to be in the right range of refraction and to provide an accurate measurement of colostrum quality.

The purpose of the study reported here was to determine whether the pH and refractometry index of preparturient mammary gland secretions could be correlated with foaling. Results were directly compared with calcium carbonate concentrations via a water hardness test kit and were used to evaluate whether the pH test and the Brix test are acceptable methods for predicting parturition in mares.

Materials and Methods

Animals—Twenty-seven pregnant Thoroughbred mares were used for 2 foaling seasons from 2009 to 2010. All horses were privately owned by the research center. A pH test and Brix test were performed on all mares for both seasons, and calcium carbonate concentration determination was performed on only 18 of the 27 mares in the second season. Among their newborn foals, 15 foals were used for measuring serum IgG concentrations at 24 hours after birth. All mares used were ≤ 10 days from foaling. They were housed individually at night and grazed every day at the Hidaka Training and Research Center in Hokkaido, Japan. Two mares were primiparous (ie, no previous foalings), and the remaining 25 mares were pluriparous (having 2 to 10 previous foalings). This study was approved by the Animal Care and Use Committee at Hidaka Training and Research Center.

Preparturient mammary gland secretion sampling—The preparturient mammary gland secretion sample was collected for 10 days prior to foaling. A minimum sample quantity of 2 mL was obtained daily, between 6:00 AM and 7:00 AM, until the pH of the preparturient mammary gland secretion samples decreased to < 7.0. Subsequently, the preparturient mammary gland secretion samples were obtained twice daily, between 6:00 AM and 7:00 AM and again between 3:00 PM and 4 PM, until parturition. Some mares did not produce sufficient quantities of preparturient mammary gland secretion 10 days prior to foaling, so samples were obtained when the amount of mammary gland secretions became sufficient.

Foal blood sampling—Foal blood samples were collected in a plain 10-mL evacuated tube by jugular venipuncture with a 21-gauge, 1.5-inch needle between 23 and 25 hours after birth. All blood samples were centrifuged, and the sera were stored at −20°C until analysis.

Designation of the day prior to foaling—Day 0 was defined as the day when the mare foaled within the nearest 24 hours after the preparturient mammary gland secretion collection. Day 1 was defined as the day when the mare foaled within the nearest 24 to 48 hours after the preparturient mammary gland secretion collection. Days 3 through 10 were defined in an analogous manner.

Calcium carbonate test methods—The preparturient mammary gland secretion samples (151 samples from 18 mares) were analyzed for calcium carbonate concentration with a water hardness kit. One milliliter of preparturient mammary gland secretion sample was diluted with 9 mL of distilled water to provide a 1:10 ratio (vol/vol) of preparturient mammary gland secretion sample to distilled water. Seven drops of dilute sodium hydroxide were added to the diluted sample, providing a pH buffer. Subsequently, 1 drop of HSNN indicator solution was added to the resultant mixture. Lastly, the diluted sample containing the pH buffer solution and the HSNN indicator solution was titrated to the equivalence point with a standard EDTA-2Na solution. The HSNN indicator initially turns red in the presence of calcium ions, followed by turning blue when sufficient EDTA-2Na solution has been added, leading to the complexation of all of the calcium ions present in solution. The calcium carbonate concentration present in the sample was calculated with the precise volume of EDTA-2Na solution required to reach the blue endpoint of the titration. The calcium carbonate concentration was calculated as micrograms per gram and was not converted to reflect micrograms per gram for the raw sample. All results were based on the calcium carbonate concentration within the diluted preparturient mammary gland secretion sample.

pH test methods—The pH of the preparturient mammary gland secretion samples (222 samples from 27 mares) was analyzed with a pH test paper,
which has an accurate pH measuring range between 6.2 and 7.6. The pH test paper was suspended in 0.5 mL of the preparturient mammary gland secretion sample for 1 second. The pH test paper was interpreted by immediately comparing the observed color with a color standard. The pH of the preparturient mammary gland secretion samples was recorded on the basis of comparison to the color standard.

**Brix test methods**—The refractometry index of the preparturient mammary gland secretion samples (214 samples from 27 mares) was analyzed by a Brix refractometer. Brix refractometry measures the concentration of any solution of dissolved solids, including protein, on the basis of the degree to which the light rays are bent. In the case of measuring preparturient mammary gland secretion, there is a possibility that it measures proteins such as immunoglobulin. Calibration of the Brix refractometer was performed following the instruction manual prior to measuring. Three hundred microliters of the preparturient mammary gland secretion sample was placed on the prism surface of the Brix refractometer. The refractometry index of the preparturient mammary gland secretion sample was directly recorded from the digital display.

**Serum IgG measuring method**—A single radial immunodiffusion test kit was used to measure foals’ IgG concentrations. The serum sample was diluted 1:22 with saline (0.9% NaCl) solution; the colostrum sample was diluted 1:32 with saline solution. Each diluted sample (5 µL) was allowed to diffuse for approximately 72 hours in a humid chamber from 2-mm-diameter wells punched in the agar layers. Antiserum specific for the IgG to be measured was incorporated into the agar layers. Calibration curves were prepared with the diameter of the precipitation rings of 50 and 200 mg/dL, as the known standards. There is a linear relationship between the diameter of the ring and the logarithm of the antigen concentration. The concentrations of IgG could be obtained by measuring the diameter of each sample precipitation ring. The values were then multiplied by 21 for the serum sample and by 51 for the colostrum sample to obtain the IgG concentrations of the original sample.

**Statistical analysis**—The Shapiro-Wilk test was used to test for normality of the distribution of all data. Normally distributed data were expressed as mean ± SD and range, and non-normally distributed data were expressed as median and range values. Foals’ mean IgG concentrations after 24 hours of age were compared between the foals from the mares, in which refractometry indices by the day of foaling decreased > 3%, and other foals from the mares, in which refractometry indices reached peak values on the day of parturition, by performance of the independent samples Student t test. Values of P < 0.05 were considered significant. Statistical analyses were performed with commercially available software. A power calculation was performed. The sensitivity, specificity, PPV, and NPV for the Brix test were calculated via the method described by Gerstman and Cappucci. The sensitivity was defined as the probability of an actual foaling based on each test. The specificity was defined as the probability of not foaling based on each test. The PPV was defined as the probability of foaling in the mares that had a positive condition as indicated by each test. The standard value of sensitivity, specificity, PPV, and NPV for each test was assessed via ROC curve analysis, when foaling occurred within 24 hours. In general, ROC curves can be used to identify the optimal cutoff between positive conditions and negative conditions for diagnostic tests, with each value on an ROC curve representing a tradeoff between sensitivity and specificity. On the basis of measures of minimal distance to the upper left corner of the ROC curve, calcium carbonate concentration of 400 µg/g (distance, 0.027) was suitable as the standard value, compared with 350 and 450 µg/g (distance, 0.048 and 0.082, respectively). A pH of 6.4 (distance, 0.014) was suitable as the standard value, compared with a pH of 6.2 and 6.6 (distance, 0.790 and 0.032, respectively). A refractometry index of 28% (distance, 0.103) was suitable as the standard value,

<table>
<thead>
<tr>
<th>Days prior to foaling</th>
<th>No. of cases</th>
<th>Calcium carbonate (µg/g) Mean ± SD</th>
<th>Median (range)</th>
<th>pH No. of cases</th>
<th>Mean ± SD</th>
<th>Median (range)</th>
<th>Refractometry index (%) No. of cases</th>
<th>Mean ± SD</th>
<th>Median (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>18</td>
<td>476 ± 85</td>
<td>483 (360–595)</td>
<td>15</td>
<td>7.5 ± 0.2</td>
<td>7.6 (7.0–7.6)</td>
<td>27</td>
<td>6.4 ± 0.1</td>
<td>6.4 (6.2–6.8)</td>
</tr>
<tr>
<td>1</td>
<td>18</td>
<td>387 ± 120</td>
<td>410 (100–595)</td>
<td>15</td>
<td>7.1 ± 0.4</td>
<td>7.2 (6.6–7.6)</td>
<td>27</td>
<td>6.7 ± 0.4</td>
<td>6.4 (6.4–7.4)</td>
</tr>
<tr>
<td>2</td>
<td>17</td>
<td>312 ± 111</td>
<td>320 (70–540)</td>
<td>23</td>
<td>7.0 ± 0.4</td>
<td>7.0 (6.4–7.6)</td>
<td>27</td>
<td>6.6 ± 0.4</td>
<td>6.6 (6.2–7.6)</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>236 ± 125</td>
<td>225 (55–452)</td>
<td>21</td>
<td>7.1 ± 0.4</td>
<td>7.2 (6.6–7.6)</td>
<td>27</td>
<td>6.7 ± 0.4</td>
<td>6.4 (6.4–7.4)</td>
</tr>
<tr>
<td>4</td>
<td>14</td>
<td>213 ± 112</td>
<td>208 (55–390)</td>
<td>21</td>
<td>7.1 ± 0.4</td>
<td>7.2 (6.6–7.6)</td>
<td>27</td>
<td>6.7 ± 0.4</td>
<td>6.4 (6.4–7.4)</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>178 ± 114</td>
<td>189 (40–570)</td>
<td>20</td>
<td>7.2 ± 0.3</td>
<td>7.3 (6.6–7.6)</td>
<td>27</td>
<td>6.8 ± 0.4</td>
<td>6.6 (6.2–7.6)</td>
</tr>
<tr>
<td>6</td>
<td>11</td>
<td>176 ± 102</td>
<td>190 (55–350)</td>
<td>19</td>
<td>7.3 ± 0.3</td>
<td>7.3 (6.6–7.6)</td>
<td>27</td>
<td>7.0 ± 0.4</td>
<td>6.4 (6.4–7.6)</td>
</tr>
<tr>
<td>7</td>
<td>12</td>
<td>161 ± 103</td>
<td>145 (50–525)</td>
<td>16</td>
<td>7.4 ± 0.3</td>
<td>7.4 (6.8–7.6)</td>
<td>27</td>
<td>6.7 ± 0.4</td>
<td>6.4 (6.4–7.4)</td>
</tr>
<tr>
<td>8</td>
<td>13</td>
<td>122 ± 94</td>
<td>80 (45–315)</td>
<td>15</td>
<td>7.4 ± 0.2</td>
<td>7.4 (7.0–7.6)</td>
<td>27</td>
<td>6.6 ± 0.4</td>
<td>6.4 (6.2–6.8)</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>155 ± 99</td>
<td>140 (45–275)</td>
<td>16</td>
<td>7.4 ± 0.2</td>
<td>7.4 (7.0–7.6)</td>
<td>27</td>
<td>6.7 ± 0.4</td>
<td>6.4 (6.4–7.4)</td>
</tr>
<tr>
<td>10</td>
<td>13</td>
<td>122 ± 94</td>
<td>80 (45–315)</td>
<td>15</td>
<td>7.4 ± 0.2</td>
<td>7.4 (7.0–7.6)</td>
<td>27</td>
<td>6.6 ± 0.4</td>
<td>6.4 (6.2–6.8)</td>
</tr>
</tbody>
</table>

Samples from 18 mares were analyzed for calcium carbonate concentration with a water hardness kit. Samples from 27 mares were analyzed for pH with a pH test paper and for refractometry index with a Brix refractometer. Day 0 was defined as the day when the mare foaled within 24 hours after preparturient mammary gland secretion collection.
compared with 18% and 22% (distance, 0.130 and 0.150, respectively).

Analyses were performed as follows: foaling within 72 hours after reaching each standard value, and foaling within 48 hours after reaching each standard value. A positive test status of each test was defined as calcium carbonate concentration ≥ 400 µg/g, pH ≤ 6.4, and refractometry index ≥ 20%. A negative test status of each test was defined as calcium carbonate concentration < 400 µg/g, pH > 6.4, and refractometry index < 20%. A positive condition status was defined as foaling occurred within 72, 48, or 24 hours. A negative condition status was defined as foaling that did not occur within 72, 48, or 24 hours.

Results

Descriptive statistics for each measurement—The 27 pregnant Thoroughbred mares ranged in age from 4 to 19 years (mean ± SD, 9.1 ± 3.3 years) and in body weight from 560 to 766 kg (1,232 to 1,685.2 lb; mean ± SD, 663 ± 53 kg [1,458.6 ± 116.6 lb]). The descriptive statistics associated with each measurement value of the preparturient mammary gland secretion samples on the day prior to foaling were summarized (Table 1). The pattern of change in each measurement value is represented (Figure 1). The calcium carbonate concentration and the refractometry index increased as the mare approached foaling, and pH decreased as the mare approached foaling. The measurement values of the calcium carbonate test, pH test, and Brix test on day 0 were 478 ± 65 µg/g (median, 483 µg/g; range, 360 to 595 µg/g), 6.4 ± 0.1 (median, 6.4; range, 6.2 to 6.8), and 23.1 ± 3.9% (median, 22.9%; range, 16.4% to 32.7%), respectively.

Sensitivity and specificity of each measurement value—The sensitivity and specificity of each measurement value were summarized (Table 2). The sensitivity for foaling within 24 hours for the calcium carbonate test (standard value set to 400 µg/g), pH test (standard value set at 6.4), and Brix test (standard value set to 20%) was 88.9%, 96.3%, and 81.5%, respectively. The specificity for foaling within 72 hours for the calcium carbonate test, pH test, and Brix test was 97.9%, 99.3%, and 86.0%, respectively.

PPV and NPV of each measurement—The PPV and NPV of each measurement value were summarized (Table 2). The PPV for foaling within 24 hours for the calcium carbonate test, pH test, and Brix test were 98.3%, 99.4%, and 96.5%, respectively. The PPV for foaling within 72 hours for the calcium carbonate test, pH test, and Brix test was 93.8%, 97.9%, and 73.2%, respectively.

Foal serum IgG measurement values—Mean ± SD serum IgG concentrations after 24 hours of age for 4 foals from the mares, in which refractometry indices by the day of foaling decreased > 3%, were 1,239 ± 330 mg/dL. In contrast, those of other foals from mares, in which refractometry indices reached peak values on the day of parturition, were 2,050 ± 667 mg/dL. Serum IgG concentrations after 24 hours of the former were significantly (P < 0.05) lower than those of the latter. In contrast, the power of this test was 0.52.
This study is the first to demonstrate the comparison among calcium carbonate concentration, pH, and refractometry index of preparturient mammary gland secretions prior to foaling for predicting parturition in Thoroughbred mares. The results of this study suggested that measurement of pH of preparturient mammary gland secretions prior to foaling with the standard value set at a pH of 6.4 was a useful method for assessing impending parturition in mares, and this was accomplished with equal effectiveness as the calcium carbonate test.

Over the past 20 years, several commercial test kits have been used extensively in the horse industry to predict foaling on the basis of changes either in the calcium or magnesium concentrations in preparturient mammary gland secretions. These methods have proven useful in the management of foaling mares but do not predict whether a given mare will foal, but rather when she is not ready to foal. This implies that these tests can be useful in indicating when intensive monitoring during the night is not necessary and therefore obviate the need for an excessive number of sleepless nights.

The results of the present study also indicated that the sensitivity and specificity of the calcium carbonate test were quite good. The sensitivity within 24 hours and the specificity within 72 hours for the calcium carbonate test (standard value set to 400 µg/g) were 88.9% and 97.9%, respectively. These results are similar to the sensitivity and specificity in a previous study (98.2% and 98.6%, respectively). However, a different calcium carbonate standard value (200 µg/g) was used in the previous study. The difference in the standard value was considered to be due to the nature of the water hardness test kit used and the method used, including the dilution ratio and the technique of calcium determination.

The purpose of a diagnostic test is to use its results to make a diagnosis; therefore, the probability that the test result will give the correct diagnosis is quite important. However, the sensitivity and specificity have limited clinical usefulness because they cannot be used to estimate the probability of disease in an individual patient. In contrast, the predictive value describes a patient’s probability of having disease. Therefore, in present study, the predictive value was more suitable for assessing the accuracy of predicting parturition than the sensitivity and specificity, analogous to that of the previous study. These values were calculated as the PPV and NPV. The PPV within 72 hours and the NPV within 24 hours for the calcium carbonate test (standard value set to 400 µg/g) were 93.8% and 98.3%, respectively. These

### Table 2—Sensitivity, specificity, PPV, and NPV of tests of preparturient mammary gland secretion samples from Thoroughbred mares with respect to actual foaling time.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Calcium carbonate ≥ 400 µg/g (n = 151)</th>
<th>pH ≤ 6.4 (n = 222)</th>
<th>Refractometry index ≥ 20% (n = 214)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 h</td>
<td>48 h</td>
<td>72 h</td>
</tr>
<tr>
<td>No. of true-positive results</td>
<td>16</td>
<td>26</td>
<td>30</td>
</tr>
<tr>
<td>No. of false-positive results</td>
<td>16</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>No. of false-negative results</td>
<td>2</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>No. of true-negative results</td>
<td>117</td>
<td>108</td>
<td>95</td>
</tr>
<tr>
<td>Sensitivity (%)</td>
<td>88.9</td>
<td>70.3</td>
<td>55.6</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>88.0</td>
<td>94.7</td>
<td>97.9</td>
</tr>
<tr>
<td>PPV (%)</td>
<td>50.0</td>
<td>81.3</td>
<td>93.8</td>
</tr>
<tr>
<td>NPV (%)</td>
<td>98.3</td>
<td>90.8</td>
<td>79.8</td>
</tr>
</tbody>
</table>

Figure 2—Photograph of commercially available pH-BTB test paper (A) showing 3 results (from left to right, 6.4 [fairy green], 7.0 [green], and 7.6 [blue]) of pH testing of 3 samples of preparturient mammary gland secretions (B). The pH test paper was suspended in 0.5 mL of the preparturient mammary gland secretion sample for 1 second. The color of the middle indicator is compared with the standard color chart located above and below.
The results are in accordance with the previous study (97.2% and 99.6%, respectively). The results also demonstrate that the water hardness test kit used in the study was useful in predicting not whether a given mare will foal, but rather in predicting when she is not ready to foal.

The pH and Brix tests were also examined as foaling-predictive methods in this study. The PPV within 72 hours and the NPV within 24 hours for the pH test (standard value set at 6.4) were 97.9% and 99.4%, respectively. The PPV within 72 hours and the NPV within 24 hours for the Brix test (standard value set to 20%) were 73.2% and 96.5%, respectively. These results highlight the fact that the pH test is useful in the management of foaling mares and can accurately predict when a mare is not ready to foal. This was accomplished with equal effectiveness of that of the calcium carbonate test. This study failed to show the physiologic mechanism of the pH reduction as foaling approaches but demonstrated that pH measurement is procedurally easier than calcium carbonate concentration determination. The pH test requires no dilution and no syringe or pipette usage and only requires a small amount of sample (approximately 0.5 mL). In addition, the test takes only 1 second to complete, providing immediate results. A pH paper turns a particular shade of green when pH is approximately 6.4 (Figure 2). On the other hand, the timely testing of the pH after sample collection is recommended to obtain an accurate value, given the possibility of changes in the pH of the test solution as a function of time.

In contrast, the Brix test was not highly predictive of foaling. For example, the refractometry index on the day of foaling demonstrated a wide variability (range, 16.4% to 32.7%), and of 27 mares foaled without reaching the standard value set at 20%. Furthermore, 8 of 27 mares demonstrated a decreasing refractometry index by the day of foaling after reaching a maximum score between 1 and 3 days prior to the day of foaling. The refractometry index by the day of foaling decreased > 3% (range, 3.4% to 5.2%) for 4 of 8 mares, after reaching a maximum score observed with milk dripping between their legs. One mare with a maximum decreasing refractometry index (5.2%) by the day of foaling after reaching a maximum score was observed dripping thick milk when walking. As such, the degree of the decreasing refractometry index appeared in proportion to the volume of dripping milk. Furthermore, the foals’ mean IgG concentrations from these 4 mares, 24 hours after birth, were significantly (P < 0.05) lower than those of other foals from mares in the study at the same time. Refractometry index from the 4 mares by the day of foaling decreased > 3%, compared with the other mares in the study, in which refractometry indices reached peak values on the day of parturition. This suggests that if the refractometry index is decreasing prior to foaling, subsequent foals born may be susceptible to failure of passive transfer due to insufficient colostrum ingestion. Thus, measuring the refractometry index before foaling may be helpful in identifying mares that drip colostrum prematurely, and measures for the prevention of failure of passive transfer in their foals can be undertaken. However, further research is required to conclude whether the refractometry index could be used to predict low colostral IgG because the power of this test was < 0.8.

References
lostrum quality by using a novel, practical method, in Proceed-
19. Cash RSG. Colostral quality determination by simple refractom-
using G*Power 3.1: tests for correlation and regression analyses. Behav 

From this month’s AJVR

Effects of reduction of inspired oxygen fraction or application of positive end-expiratory pressure after an alveolar recruitment maneuver on respiratory mechanics, gas exchange, and lung aeration in dogs during anesthesia and neuromuscular blockade

Valentina De Monte et al

Objective—To evaluate the effectiveness of reduction of inspired oxygen fraction (FiO2) or application of positive end-expiratory pressure (PEEP) after an alveolar recruitment maneuver (ARM) in minimizing anesthesia-induced atelectasis in dogs.

Animals—30 healthy female dogs.

Procedures—During anesthesia and neuromuscular blockade, dogs were mechanically ventilated under baseline conditions (tidal volume, 12 mL/kg; inspiratory-to-expiratory ratio, 1:2; FiO2, 1; and zero end-expiratory pressure [ZEEP]). After 40 minutes, lungs were inflated (airway pressure, 40 cm H2O) for 20 seconds. Dogs were then exposed to baseline conditions (ZEEP100 group) or baseline conditions with FiO2 reduced to 0.4 (ZEEP40 group) or baseline conditions with PEEP at 5 cm H2O (PEEP100 group; 10 dogs/group). For each dog, arterial blood gas variables and respiratory system mechanics were evaluated and CT scans of the thorax were obtained before and at 5 (T5) and 30 (T30) minutes after the ARM.

Results—Compared with pre-ARM findings, atelectasis decreased and PaO2:FiO2 ratio increased at T5 in all groups. At T30, atelectasis and oxygenation returned to preARM findings in the ZEEP100 group but remained similar to T5 findings in the other groups. At T5 and T30, lung static compliance in the PEEP100 group was higher than values in the other groups.

Conclusions and Clinical Relevance—Application of airway pressure of 40 cm H2O for 20 seconds followed by FiO2 reduction to 0.4 or ventilation with PEEP (5 cm H2O) was effective in diminishing anesthesia-induced atelectasis and maintaining lung function in dogs, compared with the effects of mechanical ventilation providing an FiO2 of 1. (Am J Vet Res 2013;74:25–33)

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