Proceedings of the 8th International Symposium on Canine and Feline Reproduction
ISCFR
June 22-25, 2016
Paris, France

In a joint meeting with the XIX EVSSAR Congress

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Fetal pulmonary maturity in the dog: estimation by bubble test in amniotic fluid

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The last period of pregnancy is important for neonatal survival in the extra-uterine environment. The concept of “readiness for birth” has a great significance in the canine species where the final maturation process is not yet very well understood today. During this period, the rise in fetal adrenocorticosteroids and the decline of progesterone to basal values are associated with the final lung maturation and the production of surfactant. It is suspected that an administration of the progesterone-receptor blocker aglepristone could induce the final maturation by the same mechanism but no published data has confirmed this. In human medicine, fetal lung maturity has been evaluated and analyzed on amniotic fluids sampled by amniocentesis [1]. The bubble test was used for the prediction of respiratory distress and related pulmonary immaturity in human neonatology. More recently this test has been described in puppies [2]. The aim of this study was to collect new data for evaluation of lung maturity in the neonatal puppy, to assess the presence of surfactant in amniotic fluid by using a “Bubble test” and to compare the results obtained before and after administration of aglepristone. Thirty-five healthy bitches of 18 different breeds were followed during their pregnancy before scheduling a C-section (CS). Ten out of 83 samples of amniotic fluids (12%) were collected through amniocentesis under ultrasonographic guidance on day 60 or 61 post ovulation and all bitches received an injection of 15mg/kg aglepristone. The CS was performed 20 to 24 hours later [3]. 88% (n=71) of samples of amniotic fluids were collected during CS after having removed the neonates out of the uterus and before opening the fetal bags. The samples were transferred into a plain tube whereby 1 mL of amniotic fluid was mixed with 1 mL of 95% ethanol. Both fluids were shaken vigorously for 30 seconds and then analyzed after 15 seconds. Thereafter, the samples were used to perform the Bubble test. The results were graded as follow [1]: grades 0 and 1 (absence or one row of bubbles) are negative results explaining the lack of lung surfactant in the amniotic fluid. Grades 2 to 4 (two rows to full surface covered of stable bubbles) are positives results meaning the presence of pulmonary surfactant in amniotic fluid, thus respiratory mature puppies. The amniocentesis did not show any complications in our study but a larger study is needed to prove its safety. No post-operative clinical complications were observed in any of the bitches. No pups showed any signs of prematurity and only 2 out of 86 pups died during their first 2 weeks post CS. Twenty-three out of the 71 samples (32%) of amniotic fluids were excluded because of blood or meconium contamination. We observed a significative difference (p = 0.00024) between the result of Bubble test before and 18 hours after the administration of aglepristone with 70% of samples (n=7) negative before aglepristone and 90% of samples (n=43) positive during the CS.

Based on these data we can conclude that the information on canine fetal maturity can be evaluated by a Bubble test and that aglepristone could induce production of surfactant for final maturation. These methods might be useful for evaluation of lung maturity in the canine species, but further studies are needed in a large number of mature and premature puppies to establish the canine pulmonary maturity standards.