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Quantitative evaluation of lung and liver echogenicity to assess pulmonary development of the canine fetus and to predict parturition: preliminary data

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The range of days of pregnancy in the canine species is quite variable when measured from the day of mating, and this is really relevant for clinical practice when a plan for managing parturition or planning a c-section are needed [1]. Different phases of lung maturation have been described during fetal life both in dogs and in humans: 1) embryonic phase, 2) pseudoglandular phase, occurring between 35th-46th days of gestation, 3) canalicular phase from 48th to 57th day, 4) saccular phase around 57th and 60th days, and 5) alveolar phase, occurring in the early post-natal life [2]. During the canalicular phase, type I and II pneumocytes develop thus later leading to surfactant production and lung’s maturation [2]. In human medicine, quantitative evaluation of ultrasonographic images have been used to determine fetal lung maturity [3]. This study is aimed to determine whether or not quantitative evaluation of fetal lung and liver echogenicity is related to fetal lung maturity and consequently could be used to predict parturition in the dog.

Five healthy pregnant bitches, aged 2-5 years, and weighing between 7 and 26 kg, were included in the study. All the bitches were followed during heat in order to estimate the day of ovulation (day 0) with progesterone assay. Serial ultrasonographic scans were performed by means of a micro-convex 4-9 MHz probe connected to a commercial ultrasonographic unit (Z-One, ZonareMedical Systems Inc, Mountain View, California, USA). Scans were performed during three different time periods, based on our knowledge about lung maturity phases and subsequent surfactant production: day 40-49 (period 1), day 50-56 (period 2) and day 57-63 (period 3) of gestation. Ultrasonographic settings were maintained constant throughout the scans and the different time periods. The mean grey value of specific regions of interest (ROIs) placed respectively in the lungs (LU) and in the liver (LI) of the two caudal-most fetuses was calculated by means of a freeware software (Image J, version 1.480, National Institutes of Health, Bethesda). In order to avoid the influence of depth on quantitative histogram analysis the ratio between the liver and the lungs was calculated. LU to LI ratio was 1.94 ± 0.2 during period 1, 1.39 ± 0.2 during period 2 and 1.97 ± 0.7 during period 3. Results of present study revealed that LU to LI values decreased in the second period of our study, finally increasing in the last one (Fig.1). The LU to LI mean grey value ratio seems to be an interesting parameter to be studied.