Pattern of immunoglobulin G concentration in canine colostrum and milk during the lactation

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Puppies are born almost agammaglobulinemic and colostrum intake, providing passive immunity, is indispensable for their survival[1]. As gut closure begins in puppies between 6 and 8 hours after birth and is completed in 16 to 24 hours[2], colostrum intake has to take place as soon as possible after birth. But due to parturition length, depending on the decrease rate of immunoglobulin G (IgG), some puppies may ingest colostrum of low immune quality. This study describes the changes in IgG concentration in canine mammary gland secretions and provides a definition of colostrum in the dog. Fifty-eight bitches belonging to 18 different breeds were included within one breeding kennel. Each female was followed during the whole period of lactation (from parturition to puppies weaning). No C-section was performed. Dams were categorized by breed size (small: <15kg; large: >15 kg), age (young: <2 years old; adult: 2-6 years old; old: >6 years old). Litter size was categorized into quartiles (small: lowest 25%, large for the largest 25% and medium for others), separately for small and large breed sizes. Mammary secretion was collected every 4 hours until 20 hours after parturition (H4, H8, H12, H16, H20; n=19); and then at 24 hours (H24), 36 hours (H36), 48 hours (H48), 4 days (D4), 7 days (D7), 14 days (D14) and 21 days (D21) after the parturition (n=58). IgG concentrations were analysed with commercial ELISA test (Dog IgG-Quantitation Kit, Bethyl Lab, Montgomery, USA). The effect of time on IgG concentration was assayed with Friedman's ANOVA test (Tanagra, Lyon, France). The effect of age, breed size and litter size on IgG concentration during the first 24h were tested with Kruskal-Wallis test. Data are presented as mean ± SD. IgG concentration in mammary secretion from 373 collected samples varied from 0.38 g/l to 78.8 g/l. Significant decline in IgG concentration was observed over the lactation from 38.5 ± 8.9 at H4 to 1.8 ± 2.2 at D21 with significant variations between sampling times (Table 1).

Time	H4	H8	H12	H16	H20	H24	H36	H48	D4	D7	D14	D21
IgG (g/l)	38.5^A ± 8.9	41.4^A ± 15.1	37.1^B ± 17.8	29.3^B ± 16.3	23.5^B ± 15.2	17.3^C ± 10.4	10.9^D ± 7.9	10.8^E ± 11.6	4.2^F ± 5.1	3.1^G ± 4.2	2.6^G ± 2.9	1.8^H ± 2.2

Table 1. IgG concentration in mammary secretions in the bitch (n=58). Mean values with different superscript letters were significantly different (P < 0.05).

The average decrease rate between H4-H8 and H24 was 60.0 ± 18.0% (n=19). The decrease was linked neither to the litter size, nor to the age of the bitch, but to the breed size: IgG concentration declined slower in large breeds than in small ones (49.8% vs 73.9% decrease between H4-H8 and H24, p=0.02). As the IgG concentration is decreased by more than 50% by H24, colostrum in the canine species can be defined as the mammary secretion of the first day of lactation. It could be hypothesized that the slower decline in large breeds could contribute to the higher passive immune transfer in puppies from large breeds. Longer delivery durations could also expose the puppies to a risk of deficit of passive immune transfer. Moreover, alternatives to colostrum allowing high quality passive immune transfer remain to be found: the efficacy of milk collected from a dam after the gut closure of her own puppies (between D1 and D4 for example) and frozen is to be tested.

[1] Mila H, Grellet A, Feugier A and Chastant-Maillard S. Differential impact of birth weight and early growth on neonatal mortality in puppies. J Anim Sci. 2015;93:4436-4442
[2] Chastant-Maillard S, Freyburger L, Marcheteau E, Thoumire S, Ravier JF and Reynaud K. Timing of the intestinal barrier closure in puppies. Reprod Dom Anim. 2012;47:190-193

ABSTRACT BOOK

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