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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Canine and feline colostrum: composition and modulation  
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Puppy survival within the early weeks is particularly dependent on colostrum, a specific secretion of the mammary gland produced during the first two days post-partum. Colostrum is source of nutrients and immunoglobulins (crucial, as puppies are almost agammaglobulinemic at birth). It also contributes to the maturation of some organs, especially the digestive tract. Colostrum differentiates from milk mainly based on its concentration in immunoglobulins G ([IgG]): 20-30 g/l in dog colostrum, 40-50 g/l in cats vs less than 1 g/l in milk. [IgG] rapidly drops after parturition (~50% in 24 hours [1]). Immune quality of colostrum is highly variable between bitches (from 3 to 70 g/l), with no relationship with maternal blood [IgG], dam's age, breed size or litter size. Moreover, within one bitch, the different mammary glands produce colostrums of different [IgG] (by 2 fold in mean) but the position of the mammary gland producing the colostrum with the highest [IgG] is not constant among females [2]. In contrast with large species, refractometry does not allow a reliable evaluation of colostral [IgG] in the canine [2]. After ingestion by the newborn, colostral IgG are protected from digestion by a high concentration of colostral anti-trypsins (1000 times higher than in milk). Transfer of a sufficient quantity of IgG from puppies digestive tract into its bloodstream (passive immune transfer) is crucial for their survival [3]. To be absorbed through the digestive epithelium, IgG have to be ingested before 12-16 hours after birth, time of the end of the intestinal barrier closure both for puppies [4] and kittens [5]. But colostrum not only ensures systemic immune protection, but also plays a major role for local digestive protection, thanks to a high IgA concentration. In colostrum, immunoglobulins are 55% IgG and 40% IgA, whereas in milk, proportions are 5% and 90% [6]. IgA in the digestive lumen can trap pathogens, that can be inactivated by other colostral components, such as lysozyme, lactoferrin, white blood cells and various cytokines involved into the immune response. Colostrum also provides oligosaccharides, mucin and lactadherin, preventing pathogens adhesion to the digestive epithelium. Moreover, hormones (cortisol, insulin) and growth factors from colostrum hasten intestinal barrier closure, preventing entry of pathogens into the newborns bloodstream. Besides its major role in immunity, colostrum is responsible for energy supply. In bitch and queen, energetic concentration [E] of colostrum is not superior to that of mature milk. Canine colostrum is more energetic than that in feline, and both are markedly more energetic than bovine, goat or sheep milk (making them inadequate substitutes). Variability of [E] between bitches is more limited than for [IgG] (x2 instead of x20). Variation between mammary glands also seems low, both in bitches and in queens. [E] depends on the fat concentration of the secretion and is affected by breed size (with better energetic quality in small breeds <10 kg adult body weight). Energetic supply over the two first days of life, as evidenced by puppies growth rate over the two first days of life, is one of the major determinants of puppies survival [4]. Despite colostral immune quality ([IgG]) and energetic quality ([E]) are not correlated, at the puppies level, growth rate over the two first days of life is highly associated with the quality of passive immune transfer. 40% of puppies losing weight are in deficit of passive transfer vs only 1% among those that gain weight [7]. Early and sufficient suckling of colostrum is thus the very first care to be provided to puppies and newborns for their later health and survival.