

## Immune and energy quality of canine colostrum: impact on puppies survival

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### Introduction

Colostrum, secreted over the first two days post-partum, ensures an immune and energy provision to puppies. The objective of this work was to estimate the respective impact of energy and immunity on puppy's health and survival.

**Materials et methods.** Within a breeding kennel, colostrum was collected 8-24 hours after whelping. The different mammary pairs were milked separately, and secretions mixed in equal volumes. Colostral immunoglobulins G concentration ([IgG], g/l) was assayed by ELISA (Dog ELISA Quantitation set, Bethyl Lab, Montgomery, USA). Colostral energy density ([E], kcal/g) was calculated as  $(5.86 \times \text{protein concentration} + 3.95 \times \text{carbohydrates} + 9.11 \times \text{lipids})/100$  [1].

Puppies were weighted at birth (Day 0). On 24 hours-old puppies (Day 1), blood glycaemia was assayed (Free Style Optium, Abbott, USA). At Day 2, jugular blood was collected for [IgG] assay and puppies were weighed. Growth rate was calculated as  $(\text{Weight Day 2} - \text{Weight Day 0})/\text{Weight Day 0} \times 100$ . Mortality was examined until Day 21. Results are presented as mean  $\pm$  SD. Proportions of dead or hypoglycaemic puppies depending on immune or energetic quality (by class) were compared by chi-square test, with Bonferroni correction.

**Results.** Colostrum was collected on 139 bitches from 17 breeds. Mean colostral [IgG] was  $21.3 \pm 11.9$  g/l, ranging from 3.1 to 68.8 g/l, without any influence of dam age, breed size or litter size. Colostrum was considered of low quality for colostral [IgG] < 12.4 g/l (lowest quartile), of good quality between 12.4 and 27.1 g/l and of excellent quality for [IgG] > 27.1 g/l (highest quartile). In the 657 puppies alive at Day 2, 31% were in deficit of passive immune transfer (blood [IgG] < 2.3 g/l [2]) and neonatal mortality rate was 17%. The proportion of puppies in deficit did not differ according to the colostral immune quality of their dam (respectively 7.6%, 16.0%, and 7.4%;  $p > 0.05$ ). Neither did the proportion of puppies dying between Day 2 and Day 21 (respectively 12.7%, 20.1% and 22%;  $p > 0.05$ ).

From 59 bitches, mean [E] was  $1.27 \pm 0.21$  kcal/g, ranging from 0.91 to 1.87, without any correlation with [IgG]. Among their 300 puppies, 28.3% had a glycaemia lower than 92 mg/dl at Day 1 and growth rate D0-2 was below -4% (both thresholds being associated with an increased risk of neonatal mortality [3]). [E] was considered as « low » when < 1.145 kcal/g, « good » elsewhere. The proportion of puppies with glycaemia < 92 mg/dl was higher in puppies whose dam with low [E] than for others (41.3% vs 23.9%,  $p = 0.014$ ), whereas no difference was evidenced neither for the proportion of low growth rate puppies, nor for neonatal mortality rate.

**Conclusion.** Colostral quality, immune and energetic, exhibits large variability between bitches. This work showed no relationship between immune quality and puppies survival. To date, the measurement of mean colostral value in the field will thus not help to improve puppies survival.

[1] Petzinger et al 2014 Zoo Biology, 33:305-313. [2] Mila et al 2014 Prev Vet Med 116:209-213. [3] Mila et al 2015 J Anim Sci 93(9):4436-42

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