

A high folic acid diet increases folate serum concentration in pregnant bitches

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Introduction and aims. A folate deficiency in pregnant female mammals is known to have a negative effect on fetal development, and to increase risk of dystocia [1]. This deficiency can also cause cleft palate and neural tube defects. In dogs, a serum folate level around 8 ng/ml was defined as low [2]. Folate supplementation in pregnant bitches decreased the prevalence of these congenital disorders [3]. The aims of this study were to (1) determine serum folate concentrations in bitches presented for a heat follow up and (2) evaluate the effect of dietary levels of folic acid on serum concentrations in bitches during the first month of gestation.

Material and methods. A prospective double-blind randomized trial was performed on 48 healthy adult dogs of various breeds presented at the Alfort veterinary college (Paris) for a heat follow up. Neither the owners nor the clinicians were aware of folic acid levels in the two diets. From the beginning of the heat until the 42nd day post ovulation bitches were fed either a diet containing a high folic acid level (4.5 mg of folic acid/1000 kcal; Ht42d diet, Royal Canin; n=23 dogs) or with a control diet containing 1 mg of folic acid/1000 kcal (n=25 dogs). Serum folic acid level was evaluated at three different periods: at the first visit for the heat follow up (T0), the day of ovulation (T1) and 25 days after ovulation (T2) (chemiluminescence technique; Chemtox Lab, Illkrich, France). Serum folic acid concentrations were divided in four levels 0-8; 8-16; 16-24; ≥ 24 ng/ml and proportion of dogs in each group were evaluated. A linear mixed model (proc MIXED, SAS, Cary, N.C., USA) was performed to determine the variables affecting serum folic acid levels with diet, time and body weight at T0 as fixed effects and dog as random term. Age and body weight were presented as mean \pm SD.

Results. At T0, age and body weight were not significantly different between two groups (body weight= 23.3 ± 12.8 kg, age = 3.8 ± 1.8 years). During this first consultation, 22% (10/45) of bitches presented a serum folic acid concentration below 8 ng/ml. Folic acid levels were not significantly different between two groups at T0. Folic acid levels were significantly influenced by the period of time ($p < 0.001$) and diet ($p = 0.001$) with an interaction between both parameters ($p = 0.001$). In the control group, folic acid levels at T0 were not significantly different from levels at T1 and T2 ($p = 0.595$; $p = 1$, respectively). On the contrary, folic acid levels in the high folic acid group were significantly higher at T1 and T2 compared to T0 ($p < 0.001$ and $p < 0.001$, respectively). At T1 and T2 serum folic acid levels were significantly higher in the high folic acid group compared to the control one ($p = 0.028$ and $p = 0.001$ respectively). There was no effect of the body weight on folic acid level, independently of the group ($p = 0.949$).

Conclusion. This study demonstrates that in a randomized population of breeding bitches, 22 % of females presented for a heat follow up had low serum folate concentrations. The reasons for this low level of folate can be due to a poor dietary intake. A high folic acid diet significantly increased the serum's folic acid level in this study. Therefore administration of diets rich in folic acid may be useful to supplement bitches and reduce the risk of fetal development problems, such as the cleft palate.

[1] Scholl T. et al. *Am J Clin Nutr* 2000; 71:1295–303; [2] Domosławska A. et al. *Polish Journal of Veterinary Sciences*, 2013, 16, 1, 33–37; [3] Elwood JM. et al. *N Z Vet J* 1997, 45: 254-256.



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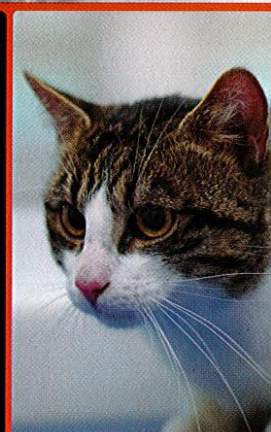
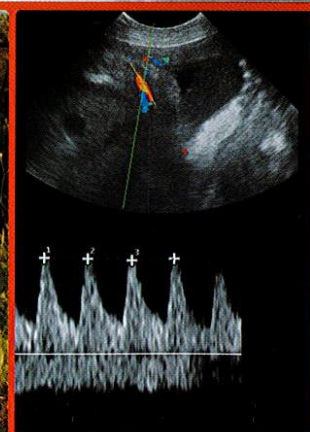
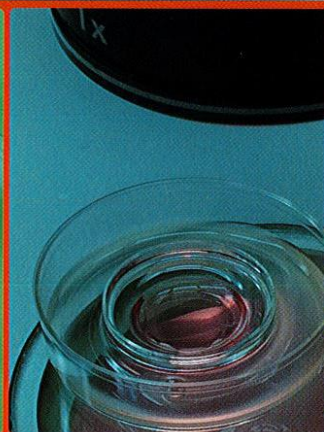
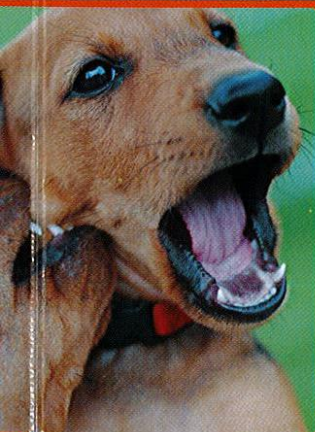
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