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

Reprinted in IVIS with the permission of the ISCFR Organizers
Energy balance in the bitch – effect on birth weight and survival in puppies
Mila, H., Bourcier, J., Grellet A., Chastant-Maillard S.
Reproduction, Toulouse National Veterinary School, UMR INRA/ENVT 1225 IHAP, Université de
Toulouse, INP-ENVT, Toulouse, France
h.mila@envt.fr

Obesity is major public health issue, both in human and in canine population. It predisposes to
medical disorders (endocrinological, orthopedics, tumoral), but also impairs reproductive function.
Infertility, miscarriage, pregnancy complications and dystocia have been described in obese women.
In sows, increased serum concentration of leptin - one of the hormones secreted by the adipose
tissue (adipokine), has been found associated with a reduction of both embryo development and
uterine contractions during parturition. This study aimed to evaluate the relationship between the
body condition score (BCS) and serum leptin concentration in pregnant bitches and its relationship
with birth weight and perinatal mortality in the canine species. The study was conducted on 41
multiparous bitches from 13 breeds within one breeding kennel (fed ad libitum the same diet). BCS
was evaluated with a 1-9 points scale and blood was collected at the time of mating (W0), and for
pregnant bitches at week 4 of gestation (W4) and 1 day after parturition (PP). According to BCS result,
females were categorized into lean (L; 1-4), ideal (I; 5), overweight (Ow; 6) and obese (Ob; 7-9). Leptin was assayed on serum samples with a commercial kit (Canine Leptin ELISA kit,
Millipore, St Charles, USA) and depending on the result, bitches were classified into those with low
(<4 ng/ml), medium (4-8 ng/ml) or high (>8 ng/ml) leptin concentration. Birth weight and mortality
in puppies from birth until 2 days of age were registered. Effect of BCS and leptin concentration at
W0, W4 and PP on birth weight (% of low-birth-weight puppies, i.e.25% lowest weights) and
perinatal mortality (stillbirths and mortality 0-2d) was evaluated with Chi square and Fisher exact
tests. At mating, 8 out of 41 bitches were L, 13 I, 10 Ow and 10 Ob, with increase in BCS
associated with higher leptin concentrations (L: mean=4.2 SD±1.7 ng/ml, I: 5.6±2.6 ng/ml, Ow:
8.7±4.0 ng/ml and Ob: 6.9±4.2 ng/ml; p=0.02). Thirty-four out of 41 bitches gave birth to 179
puppies. Leptin in pregnant bitches remained unchanged until W4 and decreased significantly after
whelping (6.3±3.2 ng/ml vs 6.0±4.6 ng/ml vs 3.9±2.3 ng/ml; p=0.002). BCS increased over the
whole gestation (W0-PP) in 9 bitches and decreased in 11. Data on birth weight were available for
160 puppies. Both leptin concentration and BCS were found associated with low birth weight and
mortality in puppies. Proportion of low-birth-weight puppies was higher in bitches with low and
high leptin concentrations at W0, W4 and PP compared with bitches having medium level (W0: low
26% (10/39) and high 37% (15/41) vs medium 14% (11/80); W4: 41% (22/54) and 41% (11/27) vs
4% (3/70); PP: 31% (28/90) and 25% (5/20) vs 6% (3/50); p<0.01 in all tests). Higher perinatal
mortality was observed in Ow or Ob females at each studied period compared with bitches with
lower BCS score (W0: 5% (4/81) vs 19%, p=0.004; W4: 2% (2/83) vs 22%, p<0.001; PP: 9%
(10/109) vs 18% (13/70), p=0.07). Since low-birth-weight puppies are at higher risk of neonatal mortality,
this study evidenced that control of mortality in puppies should include the control of
BCS in bitches, not only at whelping but also since mating.