### ABSTRACT

The thesis is composed for four articles interrelated, where is studied either as relationships between body condition and energetic mobilization in rabbits and as the effect of selection for litter size variability in body condition and energetic mobilization, such as welfare biomarkers in animal production, and in litter size and its components after seven generation of selection.

In this regard, the first article examines the relationships between measures of body condition and energetic mobilization on 157 primiparous rabbit does at mating, delivery and 10 d after delivery, using principal component analysis. Body condition was measured as body weight and perirenal fat thickness. Energetic mobilization was measured as non-esterified fatty acid concentration in blood, before (NEFAb) and after lipolysis stimulation by isoproterenol (NEFAr). All body weights and perirenal fat thickness were located on the first principal component, exhibiting high correlations between them both at the same or different times (from 0.51 to 0.83). All NEFA measurements were located on the second component, showing low correlations with body condition measurements. Both NEFAs showed high positive correlations when measured at the same time (0.65 at mating, 0.72 at delivery and 0.69 at 10 d after delivery), but low correlations when measured at different times (from 0.09 to 0.20).

The second article analyses the correlated response in body condition and fat reserves mobilization in two rabbit lines divergently selected by litter size variability during seven generations of selection. The perirenal fat thickness and the increment in NEFAs from basal concentration until adrenergic stimulation by isoproterenol were measured in 80 females from the high litter size variability line and in 74 females from the low line at second mating, delivery and 10 d after delivery. Data were analysed using Bayesian methodology. Perirenal fat thickness was similar in both lines at mating. However, the high line showed lower fat thickness than the low line at delivery (-0.16 mm, P = 0.86), and this difference remained at 10 d after delivery (-0.17 mm, P = 0.86). Moreover, this line exhibited 30% more concentration in NEFAs at delivery than the low one after adrenergic stimulation by isoproterenol (P = 0.96).

The third and fourth articles study the correlated responses to selection for litter size variability in litter size and its components. A laparoscopy was performed at 12 d of the second gestation on a total of 94 females from the high line and 82 females from the low line, in order to count the ovulation rate (OR) and the number of implanted embryos (IE). The total number of kits born (TNB) and alive (NBA) were also recorded at second parity. Embryonic (ES), fetal (FS) and prenatal (PS) survival were estimated as IE/OR, TNB/IE and TNB/OR, respectively. In the last gestation, 30 non-lactating multiparous does from each line were euthanized at 28, 48 and 72 h of gestation, and embryos were recovered by perfusion of each oviduct and uterine horns. At 28 h of gestation, normal embryos were classified as 2-cell embryos or 4-cell embryos. At 48 h of gestation, normal embryos were classified as early morulae or compacted morulae. At 72 h of gestation, normal embryos were classified as early morulae, compacted morulae or blastocysts. Data were analysed using Bayesian methodology. After seven generations of selection, ovulation rate was similar in both lines. The line selected to reduce the litter size variability showed more embryos at implantation (1.48 embryos, P = 1.00) than the high line. This line also displayed a more advanced embryonic development than the high one from 48 h of gestation, having a lower percentage of early morulae (53.32 % in the low line vs 79.90 % in the high line, P = 0.93) and a higher percentage of compacted morulae (46.87 % in the low line vs 20.29 % in the high line, P = 0.94) at 48 h of gestation, and a lower percentage of early morulae (3.88 % in the low line vs 21.04 % in the high line, P = 0.93) and a higher percentage of blastocysts (62.55 % in the low line vs 51.13 % in the high line, P = 0.71) at 72 h of gestation. A more advanced embryonic development was related to a higher embryonic survival (0.85 in the low line vs 0.78 in the high line, P =1.0). A higher uterine overcrowding of embryos in the low line did not penalise fetal survival, and as a result, this line continued showing a greater number of kits born at birth (+0.98 kits at birth, P = 0.96).

In conclusion, the first study also allowed us to corroborate in rabbits, that body weight and perirenal fat thickness are good predictors of body reserves and both measurements could be used to estimate energy changes in the mid-long term, while measurements in NEFAs should be used when an accurate measurement of energetic mobilization is needed in short term. The second study shows as a decrease in litter size variability has a favourable effect on body condition and fat reserve mobilization. In this regard, the more homogenous line for litter size seems to adapt better to adverse environments, as it has a greater capacity to mobilize energy reserves at delivery than the heterogeneous line. Besides, the third and fourth studies confirm that selection to reduce litter size variability also has a favourable effect on development of embryo and its survival, showing a higher litter size at birth.