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The Combined Use of L-Arginine and Progesterone During the Post-breeding Period in Female Rabbits Increases the Weight of Their Fetuses

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Abstract : Introduction: mortality during the implantation and early embryonic development periods reach around 30% in different mammalian species. It has been described that progesterone (P4) and Arginine (Arg) play a beneficial role in establishing and maintaining early pregnancy in mammals. The combined effect between Arg and P4 on reproductive parameters in the rabbit species is not yet elucidated, to our best knowledge. Objective: to assess the effect of L-arginine and progesterone during the post-breeding period in female rabbits on the composition of the amniotic fluid, the placental structure, and the bone growth in their fetuses. Methods: crossbred female rabbits (n=16) were randomly distributed into four experimental groups (Ctrl, Arg, P4, and Arg+P4). In the control group, 0.9% saline solution was administered as a placebo, the Arg group was administered arginine (50 mg/kg BW) from day 4.5 to day 19 post-breeding, the P4 group was administered progesterone (Gestavec®, 1.5 mg/kg BW) from 24 hours to day 4 post-breeding and for the Arg+P4 group, an administration was performed under the same time and dose guidelines as the Arg and P4 treatments. Four females were sacrificed, and the amniotic fluid was collected and analyzed with rapid urine test strips, while the placenta and fetuses were processed in the laboratory to obtain histological plates. The percentage of deciduous, labyrinthine, and junctional zones was determined, and the length of the femur for each fetus was measured as an indicator of growth. Descriptive statistics were applied to identify the success rates for each of the tests. Afterwards, A one-way analysis of variance (ANOVA) was performed, and a comparison of means was conducted by Tukey's test. Results: a higher density ($p<0.05$) was observed in the amniotic fluid for fetuses in the control group (1022±2.5g/mL) compared to the P4 (1015±5.3g/mL) and Arg+P4 (1016±4,9g/mL) groups. Additionally, the density of amniotic fluid in the Arg group (1021±2.5g/mL) was higher ($p<0.05$) than in the P4 group. The concentration of protein, glucose, and ascorbic acid had no statistical difference between treatments ($p>0.05$). The histological analysis of the uteroplacental regions, a statistical difference ($p<0,05$) in the proportion of deciduous zone was found between the P4 group (9.6±2.6%) when compared with the Ctrl (28.15±12.3%), and Arg+P4 (26.3±4.9) groups. In the analysis of the fetuses, the weight was higher for the Arg group (2.69±0.18), compared to the other groups ($p<0.05$), while a shorter length was observed ($p<0.05$) in the fetuses for the Arg+P4 group (25.97±1.17). However, no difference ($p>0.05$) was found when comparing the length of the developing femurs between the experimental groups. Conclusion: the combination of L-arginine and progesterone allows a reduction in the density of amniotic fluid, without affecting the protein, energy, and antioxidant components. However, the use of L-arginine stimulates weight gain in fetuses, without affecting size, which could be used to improve production parameters in rabbit production systems. In addition, the modification in the deciduous zone could show a placental adaptation based on the fetal growth process, however more specific studies on the placentation process are required.

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