
Applicability of color-Doppler ultrasonography in cattle reproductive management

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The low reproductive performance in cows submitted to estrous synchronization programs are mainly related with the stage of maturation of the preovulatory follicle (POF), interval until ovulation, and the exact time for artificial insemination. Moreover, vascularity of the POF seems to influence oocyte quality, size of the corpus luteum (CL), and its ability to produce progesterone (P4). Therefore, our recent studies aimed to determine the applicability of color-Doppler ultrasonography to detect healthy POFs, predict the exact moment of ovulation, future CL size, and P4 production during an estrous synchronization protocol in cattle. Firstly, we compared different methodologies for evaluation of follicle wall blood flow, either subjectively or objectively, to establish a reliable technique to assess follicle vascularity in synchronized cows. Secondly, we investigated the size and blood perfusion of the POF wall as indicators to predict the size of the subsequent CL and its capacity to produce P4 after estrous synchronization. Comparison among subjective (barn vs. laboratory evaluation) and objective (colored pixel area and percentage of follicle wall circumference under blood flow) methods showed an increase ($P<0.0001$) in follicle blood flow over time and a group-time interaction ($P<0.0001$), but no differences among the methods of evaluation. Pearson correlation coefficients among methods and operators showed that the different methods for evaluating follicle blood flow exhibited positive correlations ($r=0.42-0.96$; $P<0.0001$). Higher correlations were observed between the dimensions of POF and/or CL and blood flow of both structures, as well as POF and/or CL blood flow with plasma P4 concentrations of the resultant CL. Therefore, our results demonstrated the applicability of blood flow ultrasonography to detect animals with higher fertility potential based on follicle vascularity before ovulation in synchronized cows. In conclusion, color-Doppler ultrasonography associated with the available reproductive technologies may enhance the pregnancy rates in cows.

Keywords: color-Doppler ultrasonography, follicle blood-flow, fertility, cattle