Effects of different applications of pyrethrin/pyrethroid insecticides on bull reproductive parameters

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Increasing concern in the beef industry has arisen over the use of pyrethroid and pyrethrin insecticides due to the well documented negative effects on semen quality and steroid hormone production in a variety of mammals. However, recent experiments with beef bulls demonstrated no effects on sperm motility or morphology when pyrethroid insecticides were applied at labeled doses. The objectives of the current study were to determine the effects of pyrethroid and pyrethrin sprays used in combination with pour-on and fly tags on bull sperm motility and serum testosterone concentrations. Our hypothesis was that the addition of pyrethrin and pyrethroid spray applications would have a negative effect on bull reproductive parameters. Angus x Simmental bulls (n = 23; average initial BW = 796 ± 160 kg) were blocked by source and randomly assigned to 1 of 2 treatments: 1) pour-on and fly tags (CONT; n = 12), or 2) pour-on, fly tags, premise spray and fog spray (EXP; n = 11). The CONT group was treated with Cylence pour-on (active ingredient cyfluthrin; 1%) at the labeled dose on weeks 0 and 4 and with 2 Cylence Ultra fly tags (active ingredients beta-cyfluthrin; 8% and piperonyl butoxide; 20%; Bayer Animal Health, Shawnee Mission, KS) on week 0. The EXP group was treated as CONT group, but also received Tempo premise spray (active ingredients beta-cyfluthrin, cyano and methyl 3; 11.8%; Bayer Animal Health) once a week and LD-44Z fog spray (pyrethrins; 0.5% and piperonyl butoxide; 4%; Chem-Tech, Des Moines, IA) once a day at labeled dosages. All bulls were housed in individual stalls within barns, but treatment groups were separated by aisles throughout the entire ten week experimental period. Scrotal circumferences were measured at weeks 0 and 9. Semen was collected weekly via electroejaculation. Whole blood, as a source of serum, was collected from the tail vein weekly for peripheral blood testosterone concentrations. Semen was analyzed for progressive and overall motility using computer-assisted semen analysis. All data were analyzed in MIXED procedure of SAS and repeated measures were used to test the treatment x week interactions for fertility parameters. There were no differences in initial or final scrotal circumferences (P ≥ 0.22). There was a treatment x week interaction (P < 0.01) for overall motility, progressive motility, and testosterone concentrations. At week 2, overall motility was greater (P = 0.05) for CONT than EXP; however, there were no differences (P ≥ 0.12) in overall motility at other times. Progressive sperm motility tended to be reduced (P = 0.07) at week 2 and increased (P = 0.08) at week 7, but did not differ (P ≥ 0.15) in other weeks. Serum testosterone concentrations were reduced (P = 0.05) by week 1 in EXP when compared to CONT; however, concentrations did not differ again until week 9 when EXP bulls had a 2-fold decrease (P < 0.01) in serum testosterone concentrations compared to CONT bulls. This steep decline at week 9 suggests a delayed effect of the pyrethroid and pyrethrin spray applications on peripheral testosterone concentrations. Further work, extending the project to include additional spermatogenic cycles, is necessary to evaluate the long-term effects of pyrethrin and pyrethroid insecticide applications on bull reproductive parameters.

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