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Effects of administration of ergotamine tartrate on fertility of yearling beef bulls

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Abstract

Sixteen yearling bulls were utilized to investigate administration of ergotamine tartrate on semen parameters, fertilization, and endocrinology. Bulls were allotted to a control diet of cracked corn, corn silage, and soybean meal (CON, $n = 8$) or a diet supplemented daily with 40 μg/kg body weight of ergotamine tartrate (ET, $n = 8$). Blood samples, average daily gain, scrotal circumference and rectal temperatures were collected every 14 day. Semen samples were obtained every 60 day and evaluated for motility and morphology. Scrotal temperatures were obtained by thermography immediately before electroejaculation. Semen from a subset of bulls from each treatment was also evaluated for in vitro fertilization. Administration of ET increased rectal temperature and resulted in lower scrotal temperatures compared to CON bulls ($P < 0.05$). However, prolactin, scrotal circumference, testosterone, and semen motility and morphology did not differ between groups throughout the experimental period (224 day). Cleavage rates of embryos derived from in vitro fertilization (IVF) with semen of bulls, fed with ET, were reduced compared to CON ($P < 0.05$); however, development of cleaved embryos to blastocyst did not differ between treatments. In conclusion, extended exposure of bulls to ET appeared to reduce fertilization potential of sperm.
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Keywords: Fescue toxicosis; Ergotamine tartrate; Bull; Spermatozoa; Fertility

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1. Introduction

Fescue toxicosis results from ingestion of tall fescue infested with the endophyte, *Neotyphodium coenophialum*. Prevailing signs such as elevated body temperature, vasoconstriction of capillaries, and reproductive problems associated with fescue toxicity have contributed to massive declines in overall productivity. Mechanisms by which fescue toxicosis reduces cattle performance are not clearly understood but appear to involve various alkaloid compounds [1]. Consumption of endophytic tall fescue lowered nutrient intake and digestibility [2]. Fescue toxicosis affects reproductive performance, growth, and lactation [1]. Acute exposure of steers to an elevated dose of systemically delivered ergotamine elevated plasma concentrations of cortisol and triiodothyronine [3]; these hormones are involved in mediating metabolic processes and subsequent nutrient utilization. Fescue toxicosis has also been linked to reduced LH concentrations [4], compromised embryonic development [5], and reductions in pregnancy rates [6]. Hoveland [7] calculated that producers lose $ 609 million annually due to decreased calf gains and lowered conception rates associated with fescue toxicosis. While research has clearly documented how fescue toxicity affects female reproduction, few studies have examined the effects of fescue toxicosis on male reproductive performance.

The objective of the present study was to investigate effects of simulated fescue toxicosis (administration of ergotamine tartrate(ET)) on semen parameters, endocrine profiles, and developmental competence of oocytes fertilized in vitro with semen from bulls fed with ET.

2. Materials and methods

2.1. Animals and treatments

Sixteen Angus crossbred bulls were utilized to determine effects of ET administration on semen parameters, endocrine profiles and in vitro fertilization (IVF). Bulls, approximately 350 kg body weight and 270 day of age, were assigned to one of two groups. Breed composition, weaning weight, hip height, scrotal circumference (SC), and age were used to allot bulls to treatment groups. Prior to experimental period (224 day), bulls were weaned at the beginning of September and fed corn silage. From mid-November to the end of June in central Tennessee, bulls were fed a diet of corn silage, cracked corn, and soybean meal formulated to meet NRC [8] requirements for gain. Both groups of bulls were offered a diet of 2.5% body weight of feed (on a dry matter basis), which was formulated for a 0.850 kg gain/day and to be isonitrogenous and isocaloric throughout the experimental period. Bulls limited to this diet served as controls (CON, $n = 8$). The base diet was supplemented daily with 40 μg/kg body weight of ET for the treatment group (ET, $n = 8$; provided by Dr. Miroslav Flieger, Institute of Microbiology, Czech Republic). In order to maintain a dose of 40 μg/kg body weight, the amount of ET administered was increased as body weight (BW) increased. Water and minerals were available ad libitum. ET was administered to simulate fescue toxicity, since it mimics the action of the natural

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