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A CIDR-based timed AI protocol can be effectively used for dairy cows with follicular cysts

Ill-Hwa Kim [a,*], Guk-Hyun Suh [b], Ui-Hyung Kim [a], Hyun-Gu Kang [a]

[a] *Laboratory of Theriogenology, College of Veterinary Medicine, Chungbuk National University, Cheongju, Chungbuk 361-763, South Korea*

[b] *National Livestock Research Institute, RDA, Cheonan, Chungnam 330-800, South Korea*

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Abstract

The present study evaluated whether a controlled internal drug release (CIDR)-based timed AI (TAI) protocol could be used as an efficient tool for the treatment of ovarian follicular cysts in lactating dairy cows. In the first experiment, lactating dairy cows diagnosed with follicular cysts were randomly assigned to two treatments: (1) a single injection of GnRH at diagnosis (Day 0) and AI at estrus (AIE) within 21 days (GnRH group, $n = 70$), or (2) insertion of a CIDR device containing progesterone and an injection of GnRH on Day 0, $PGF_{2\alpha}$ injection at the time of CIDR removal on Day 7, GnRH injection on Day 9, and TAI 16 h after the GnRH injection (CIDR-based TAI group, $n = 65$). Conception rate after the CIDR-based TAI protocol (52.3%) was greater ($P < 0.05$) than that after AIE following a single GnRH injection (26.9%). In the second experiment, lactating dairy cows diagnosed with follicular cysts (Cyst group, $n = 16$) and cows having normal estrous cycles (CYC group, $n = 15$) received the same treatment: a CIDR device containing progesterone and an injection of GnRH on Day 0, $PGF_{2\alpha}$ injection at the time of CIDR removal on Day 7, and GnRH injection on Day 9. The proportion of cows with follicular wave emergence and the interval from treatment to follicular wave emergence did not differ ($P > 0.05$) between groups. The mean diameters of dominant follicles on Days 4 and 7 as well as preovulatory follicles on Day 9, and the synchrony of ovulation following the second injection of GnRH did not differ ($P > 0.05$) between groups. These data suggest that the CIDR-based TAI protocol results in an acceptable conception rate in dairy cows with follicular cysts.

Keywords: Dairy cows—ovarian follicular cysts; CIDR; GnRH; Ovarian follicular waves

* Corresponding author. Tel.: +82 43 2612571; fax: +82 43 2673150.
E-mail address: illhwa@chungbuk.ac.kr (I.-H. Kim).

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1. Introduction

Ovarian cystic degeneration in cows is characterized by persistent anovulatory follicular structures in the absence of CL and interrupted or abnormal estrous cycles (Lopez-Diaz and Bosu, 1992). Ovarian cysts are a major reproductive disorder responsible for economic loss in the dairy industry (Bartlett et al., 1986; Borsberry and Dobson, 1989). The incidence of ovarian cysts in dairy cows ranges from 6 to 30% (Casida and Chapman, 1951; Bierschwal, 1966; Morrow et al., 1966; Whitmore et al., 1974; Britt et al., 1977; Kesler and Garverick, 1982), and is generally greatest between 30 and 60 days postpartum (Menge et al., 1962; Morrow et al., 1966; Whitmore et al., 1974; Erb and White, 1981), although it occurs frequently during late lactational periods (Bartlett et al., 1986).

Lack of release or inappropriate release of GnRH at the time of estrus appears to be an important pathological factor in development of ovarian cysts (Garverick, 1999), although the exact cause of ovarian cyst production is not certain. Treatment with GnRH induces luteinzation of cystic structures or initiates ovulation of other follicles from the cystic ovary (Kesler et al., 1981; Cook et al., 1990; Jou et al., 1999; Douthwaite and Dobson, 2000), and the resultant luteinized cysts or CL undergo spontaneous regression. Thus, a single GnRH treatment has been the standard treatment for cows with ovarian cysts (Bierschwal et al., 1975; Seguin et al., 1976; Nakao et al., 1992; Osawa et al., 1995). However, a large proportion (25–39%) of cows with ovarian cysts treated with GnRH did not respond (Cantley et al., 1975; Nakao et al., 1992; Osawa et al., 1995; Tebble et al., 2001), probably because other follicles capable of responding to GnRH were not present (Tebble et al., 2001). Therefore, we hypothesized that the addition of controlled internal drug release (CIDR) at the time of GnRH treatment might reduce LH level resulting in atresia of the cysts, followed by a new follicular wave in response to increasing FSH in cows with ovarian cysts, even in the absence of other mature follicles. Additionally, we predicted, that this treatment would result in the ovulation from other follicles in the ovaries with the cysts. Subsequent injections of $PGF_{2\alpha}$ and the second treatment with GnRH, as in the Ovsynch protocol, would also be expected to enable cows to ovulate synchronously for TAI. Our first objective was to evaluate conception rates in lactating dairy cows with follicular cysts treated with a CIDR-based TAI protocol or a single GnRH injection, which has previously been the standard treatment for cows with ovarian cysts. The second objective was to compare the effects of the CIDR-based TAI protocol on ovarian follicular dynamics and synchronized ovulation between cows with follicular cysts and cows having normal estrous cycles.

2. Materials and methods

2.1. Herds and experimental animals

The present study was performed over the period from January 2003 to May 2005 on eight Holstein dairy farms located in Chungbuk province, Central Korea. All herds contained 50 or more cows and received reproductive health checkups every 2 weeks from veterinarians at the College of Veterinary Medicine at Chungbuk National University, Korea. All experiments were performed with the approval of the Animal Ethics Committee of University. Lactating dairy cows were maintained in free-stall facilities, fed a total mixed ration, and milked twice daily. Average milk yield was 9,190 kg per year per cow.

Cows were diagnosed as cows with ovarian follicular cysts using ultrasonography (Sonoace 600 with 5.0 MHz linear-array transducer; Medison Co. Ltd., Seoul, Korea) when single follicular