Repro Tracks

by **Cliff Lamb,** *Texas A&M University*

Estrus-synchronization products

Spring is approaching, and many folks are going to be planning for the upcoming spring breeding season. During the year, I receive numerous questions focusing on estrus-synchronization protocols and the products used in those protocols. There also appears to be some confusion in the understanding of what each of the products is responsible for in an estrus-synchronization protocol. Therefore, I thought it would be good to clarify some of the questions that I frequently receive. To help answer these questions, one of my graduate students, Nicky Oosthuizen, has recently summarized some work that applies, and I have used some of her summary to help answer these questions.

Understanding the process

What are the different hormones used for estrus synchronization, and what do they do?

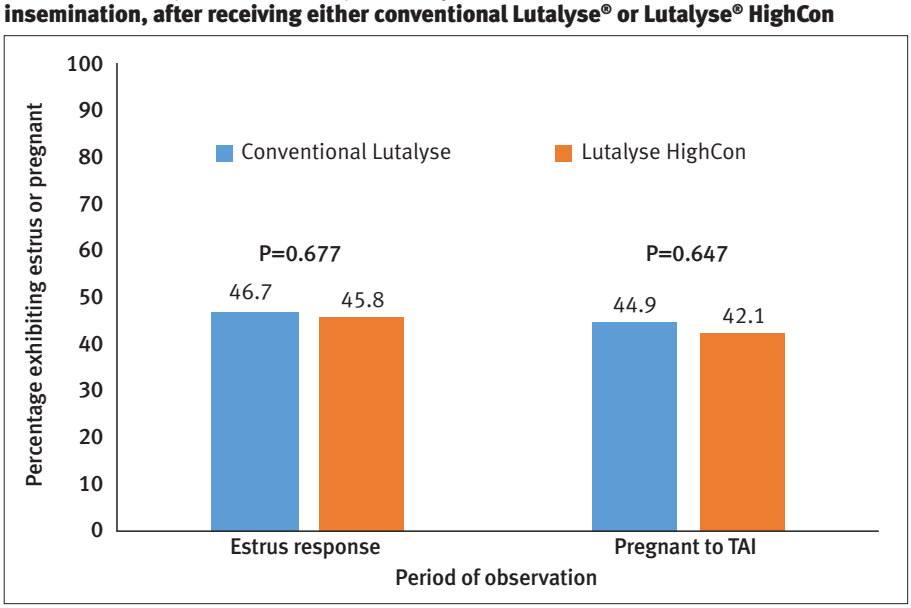
Hormones used in estrus synchronization typically include a combination of three hormones (or analogues) that work to control different facets of the estrous cycle of cattle. These hormones are progestins, prostaglandin F2α (PGF), and gonadotropin-releasing hormone (GnRH) and may be used to stimulate the estrous cycle at certain points.

These hormones may also be used to mimic certain phases of the estrous cycle, such as supplemental progestins used to increase concentrations of progesterone, and thus mimicking the point in the estrous cycle when females do not express estrus. Other roles of these products include inhibition of ovulation with the use of a progestin, induced *corpus luteum* (CL) regression with PGF, synchronization of follicular waves, and induced ovulation with the use of GnRH, or a combination of these strategies.

How does prostaglandin F2α (PGF) work?

Typically, PGF is a fatty-acid hormone that is synthesized in and released from the uterine endometrium of a nonpregnant female. In cattle, PGF diffuses into the ovarian artery from the uterus via the uterine vein in order to induce luteolysis (or death) of the CL. For estrus synchronization, PGF analogues are administered to induce CL regression. PGF can induce the regression of the CL but does not inhibit ovulation. Therefore, it is only in effect when the female has a functional CL, usually between days 5 and 16 of the estrous cycle.

Fig. 1: Estrus response rates and pregnancy rates of beef heifers to fixed-time artificial insemination, after receiving either conventional Lutalyse® or Lutalyse® HighCon



Are there different PGF products on the market, and is one product more effective than the other?

Synthetic PGF hormones (analogues) such as dinoprost tromethamine and cloprostenol sodium are the active ingredients in common luteolytic exogenous hormones commercially marketed in the United States as Lutalyse®, Lutalyse® HighCon, Prostamate®, Estrumate®, In-Synch®, SYNCHSURE™, and estroPLAN®.

Although there are numerous biases in the field and various people believe that one product is more effective than another, numerous studies on the efficacy of different PGF analogues have been performed. Collectively, these studies have reported no differences among PGF products in their ability to decrease concentrations of progesterone and to induce an estrous response.

Further, the comparison of the two most popular products (Lutalyse® and Estrumate®) has been extensively studied and compared, while individual studies may show marginal improvements of one product over another, collectively no differences between products for estrous detection, conception and pregnancy rates are evident.

What can you tell me about the recently released Lutalyse® HighCon PGF product?

A high-concentrate PGF product, Lutalyse HighCon, has recently been approved for use by the FDA. According to label indications, Lutalyse HighCon may be administered either intramuscularly (IM) or subcutaneously (sub-Q) in bovine females.

The advantage of the sub-Q route of administration is that the occurrence of blemishes on beef carcasses may be reduced. Many producers have asked about the effectiveness of this product in estrus-synchronization protocols, so we performed a study to evaluate the efficacy of Lutalyse HighCon in comparison with Lutalyse.

Our results demonstrated estrous expression and pregnancy rates were similar between the treatments (see Fig. 1), indicating that Lutalyse HighCon may be a suitable alternative to conventionally concentrated PGF products, such as Lutalyse, in estrus-synchronization protocols for beef heifers.

CONTINUED ON PAGE **174**

CONTINUED FROM PAGE 172

What is the role of progestins in estrus synchronization?

Progesterone is secreted by the CL on the ovary and is responsible for the maintenance of pregnancy. Progestins are a synthetic form of progesterone that, when used in estrus-synchronization protocols, serve as an "artificial" CL. The primary objective of administering progestins is to inhibit estrous activity and ovulation.

Progestins also induce noncycling (prepubertal) heifers to initiate estrous cycles (attain puberty) and improve their chances of establishing pregnancy during a defined breeding period. In the United States, progesterone is typically provided to cattle in the form of a controlled internal drug release (CIDR®) vaginal insert, or is fed in the form of the orally active melengestrol actetate (MGA). With MGA, heifers need to consume it in daily amounts of 0.5 mg per head for it to be effective. Heifers that do not consume the required amount may return to estrus prematurely, which may reduce the estrous response.

How does gonadotropin-releasing hormone (GnRH) work?

Simply put, GnRH is secreted by GnRH neurons in the basal hypothalamus and is responsible for the release of luteinizing hormone (LH) from the pituitary. If a dominant follicle (≥ 10 mm) is present on the ovary at the time of GnRH administration, then the resulting LH surge (after two to four hours) will induce ovulation (24-36 hours later). If the female ovulates in response to GnRH, a CL will be formed, which can then undergo induced luteolysis with the use of PGF 6 days after GnRH administration.

What GnRH products are available for estrus synchronization, and are any products more effective than others?

Different forms of native GnRH are used in estrus-synchronization protocols, such as gonadorelin diacetate tetrahydrate (sold as OvaCyst®, Fertagyl® and Cystorelin®), gonadorelin acetate (sold as GONAbreed®), and gonadorelin hydrochloride (sold as

Factrel®). Numerous studies have been conducted to test whether differences occur among the products. While individual studies may report subtleties in response, collectively, when pregnancy rates are considered, no differences among products have been noted.

Where can I find the best place for additional information on estrus synchronization and enhancing pregnancy rates in beef cattle?

The Beef Reproduction Task Force (BRTF) was formed in 2000, when the need arose for beef extension personnel to be able to effectively communicate the latest information on reproductive technologies to beef producers. The BRTF is composed of a team of reproductive physiology experts from a variety of universities around the United States with a common goal of educating producers on reproductive technologies.

The goals of the BRTF team are to promote wider adoption of reproductive technologies among cow-calf producers, to educate cow-calf producers in management considerations that will increase the likelihood of successful artificial insemination (AI) breeding, and to educate producers on the benefits that can result from the use of improved reproductive technologies.

Every year the BRTF releases an updated sheet of recommended estrus synchronization and timed-AI (TAI) protocols that have been tested and have been proven to be effective for beef cows and heifers. In addition, the BRTF has a website *(http://beefrepro.unl.edu/)* that provides numerous additional resources for producers who need information on reproductive management of beef cattle.

EMAIL: gclamb@ufl.edu

Editor's Note: *Cliff Lamb became head of the Department of Animal Science for Texas A&M University March 1.*