ARPAS Symposium: Reproductive efficiency of beef cows—Current status and new technologies

366 Nutrition and management of cows—Supplementation and feed additives. Richard J. Rasby*[1] and Rick N. Funston[2], *[1]University of Nebraska, Lincoln, NE, [2]University of Nebraska West Central Research and Extension Center, North Platte, NE.*

Reproductive efficiency is the primary factor affecting profitability of a cow/calf enterprise. The objective is to review how nutrition affects reproduction in beef females and subsequent calf performance. Nutrition has profound effects on reproduction in beef females. Body condition is an indicator of nutritional status and when used in conjunction with BW change can provide a useful method to assess reproduction. Body energy reserve at calving is the most important factor influencing pregnancy rate in beef females. Energy and protein are the nutrients required in the greatest amounts and are the first priority in nutritional programs to optimize reproduction. Beef females underfed and/or in poor body condition lack ovarian activity as a result of suppression of pulsatile release of LH under the control of GnRH. Factors affecting the postpartum interval and pregnancy rate include breed type, suckling status, age, dystocia, energy and protein supplementation pre and post calving, and BCS pre and post calving. Using management strategies to influence when a beef female calves during the calving season affects future productivity of both dam and offspring. Feeding an ionophore results in earlier return to estrus postpartum. The effect of feeding fat pre or postpartum on reproductive performance in beef females has been extensively researched but results are inconclusive. Recent research has evaluated how energy restriction after AI affects embryo development and survival. Nutritional considerations and effects on reproduction have focused on postnatal development; however, prenatal nutrition appears to have potential effects on subsequent reproductive performance in beef cattle. No feed ingredient exists that will compensate for a diets deficient in any nutrient or poor body condition score.

Key Words: beef cow, nutrition, reproduction

367 Selection of a calving season. R. N. Funston*[1], E. E. Grings[2], A. J. Roberts[3], and B. T. Tibbitts[4], *[1]University of Nebraska West Central Research and Extension Center, North Platte, NE, [2]South Dakota State University, Brookings, SD, [3]Fort Keogh Livestock and Range Research Laboratory, Miles City, MT, [4]University of Nebraska West Central Research and Extension Center, North Platte, NE.*

Calving date affects cost and timing of production events. Due to the polyestrous nature of beef females, producers can choose a calving date that fits their production system and geographic region. Any time an entire production system is considered, decision making becomes complex. Any calving system, regardless of date, should address the relationship between nutritional requirements of beef females and the quality and quantity of available feed. Nutritional status of beef females is influenced by stage of production, and the environment, including; length of growing season, forage species, day length, topography, forage quality and availability, ambient temperature, annual rainfall, and weather extremes. These differences cause grazing and feeding strategies to vary across regions. Ideally, high nutrient demand at parturition and peak lactation overlaps with optimal weather conditions and seasonal peaks in forage quality, and lowest nutrient demand overlaps with lowest quality forage, to minimize supplemental feed cost. Calving systems that do not match nutritional demand with forage quality must address potential nutrient deficits faced by breeding females, likely occurring in late gestation and early lactation. Alternative calving systems with higher feed costs need to justify alternative dates through increased revenue generated from higher market value, increased calf performance, or improved reproductive performance. Heat stress, resulting from high temperature and humidity, can reduce calf performance and negatively affect reproductive performance in both the male and female. Hot and humid regions may favor a breeding season during seasonally lower temperatures to minimize poor reproductive performance. Additionally, regions prone to freezing temperatures, heavy snowstorms, or other severe weather events, must consider such risks when choosing a calving date. Many differences exist across regions in regard to environment, production systems, and marketing strategies that contribute to the complexity of choosing a calving date; therefore, beef producers must make site-based decisions according to conditions present on their operation.

Key Words: calving date, calving season, reproduction

368 Advantages of current and future reproductive technologies for beef cattle production. G. Cliff Lamb*, Vitor R. G. Mercadante, Darren D. Henry, Pedro L. P. Fontes, and Nicolas DiLorenzo, *North Florida Research and Education Center, University of Florida, Marianna, FL.*

The refinement of current and development of new technologies aimed at increasing the productivity of the resources while minimizing the environmental impact will be critical to meet the global food demand in the near future. During the past 50 years assisted reproductive technologies have been developed and refined to increase the prolificacy and quality of calves from beef females. Artificial insemination (AI), estrous synchronization and fixed-time AI (TAI), semen and embryo cryopreservation, multiple ovulation and embryo transfer (MOET), in vitro fertilization, sex determination of sperm or embryos, and nuclear transfer are technologies that are used to enhance the production efficiency of beef systems. Development and implementation of these technologies is responsible for significant changes to world production of beef. Sales of beef semen for AI increased from 3.3 to 13.0 million units between 1993 and 2010 in Brazil, whereas that in the US has increased from 2.9 to 4.4 million units during the same period, likely as a result of the development of practical TAI systems that have allowed beef producers the opportunity to eliminate detection of estrus in their AI programs with a high degree of success. Similarly, the quantity of in vivo produced embryos transferred worldwide has increased from 361,000 in 1997 to 506,000 in 2012. In addition, during the last 15 years the transfer of in vitro produced embryos has increased more than 300%. Incorporating applied reproductive technologies continues to affect beef cattle production systems by providing producers opportunities to enhance genetics, reduce transfer of disease, advance fertility, and ultimately increase offspring value. Improvements in fertility and technology, reductions in cost, and improvements in ease of application will ensure that more cattle producers will adopt applied reproductive technologies in future years. However, incorporation of applied reproductive technologies into production systems will vary worldwide depending on cattle markets, infrastructure, production systems, and climate.

Key Words: beef cattle, reproductive technology, fertility

369 Use of ultrasonography to make management decisions.

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Transrectal ultrasonography has been available for making management decisions since the mid 1980s. This technology allows for the real-time visualization of internal structures (i.e., ovary and fetus) that are otherwise difficult to evaluate. The use of this technology in making reproductive management decisions can be divided into 3 key areas: (1) selection of animals to be kept in the breeding herd, (2) increasing the likelihood of reproductive success, and (3) pregnancy determination. When selecting replacement animals, ultrasonography can be utilized to assess antral follicle counts in females. Antral follicle counts have a direct impact on animal fertility. Around the start of the breeding season transrectal ultrasonography can be utilized to determine puberty status, reproductive tract score, and estrous cycling status. In addition it can be used to determine response to synchronization protocols (presence of a dominant follicle, ovarian cyst, and follicle diameter), or if other assisted reproductive technologies are being utilized it can be used to predict success (superovulation response or presence of a CL for embryo transfer). Following insemination this technology can be used to determine pregnancy status as early as 28 d after insemination, fetal age and sex, and presence of multiple offspring. The largest limitations to the use of ultrasonography include the time and technical skills required, and the strain on the arm and shoulder. While handles can be used for pregnancy diagnosis exams, measurements on the ovary require consistent placement of the transducer that to date can only be accomplished manually. Future improvements that may overcome some of these limitations include better imaging software, larger hard drives allowing the storage of video clips, and improved diagnostic capabilities of the machine (i.e., software that will be able to use pixel density to categorize ovaries). Color doppler images are being explored for earlier pregnancy diagnosis by blood flow to CL. Thus transrectal ultrasonography has and will have a role in the successful reproductive management of cattle herds. USDA is an equal opportunity provider and employer.

Key Words: ultrasonography, reproductive management