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Mini Review

Managemental And Environmental Causes of Infertility

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Abstract

The livestock business suffers greatly from infertility in farm animals. Diseases, poor nutrition, insufficient herd management, inherited and congenital factors, hormonal disruptions, or environmental changes all disrupt these rhythms, rendering the animal infertile and affecting the breeding programmes, even if only temporarily. As a result, each cause must be correctly identified and treated in accordance with the findings of the examination. Some metabolic and nutritional variables have been linked to infertility in recent research. Lower levels may result in anestrus or irregular heats. The lack of energy during the postpartum period decreased luteinizing hormone output and dynamic follicle diameter, although it increased calving interval time. Stress is one of the environmental elements that affects livestock handling and production.

Keywords: Infertility; Poor Nutrition; Herd Management; Environmental; Postpartum; Stress

Introduction

Reproductive success is dependent on a complex series of events involving the interaction of numerous tissues and physiological events. To name a few, these are the hypothalamus, pituitary, ovaries, uterus, embryo, foetus, endocrinology, intracellular signalling, gene transcription, and protein formation and modification. Because reproduction and fertility are such important components of successful dairy enterprises, these events have piqued the interest of physiologists and practitioners (e.g., farmers), and proper management and understanding of these events is critical for a positive outcome.

Parturition in cattle and uterine health

The ease with which cows calve has numerous implications, not only for cow welfare but also for future reproduction and fertility.

- Dystokia (leading to calving assistance and possibly caesarean section)
- The birth of twins or a dead calf, and
- Retained foetal membranes

are a number of factors that have a detrimental impact on subsequent reproductive success, the physiology of which centres around higher uterine disease prevalence and a longer-term unfriendly uterine environment for pregnancy establishment. Contamination of the uterus by bacteria around the time of parturition is unavoidable, and in the first two weeks after parturition, up to 80 to 100 percent of cattle have bacteria in their uteri, which aids these cows in dealing with this contamination [1]. Those who do not do so develop metritis, and it is well acknowledged that pathogenic germs persist in around 20% of cows beyond 3 weeks postpartum, a condition known as 'endometritis' [2,3].

In cows with twins, stillbirth, dystocia, or retained foetal membrane, the risk of uterine infection is increased, and this type of infection has negative consequences for the subsequent establishment of pregnancy [4]. A hostile uterine environment disrupted endocrine pathways, and perturbations in ovarian function and oocyte development are among the causal links between uterine infection and infertility [3]. From a management standpoint, parturition trauma must be minimized, and because uterine contamination is almost unavoidable, cows must be closely monitored for signs of uterine infection and necessary treatments administered as soon as possible. Raising cows to have a strong and robust immune system is a growing area of interest, and it is influenced by the post-partum metabolic environment, which is also an important management issue to optimize.

Bovine post-partum metabolic environment and ovarian activity

Milk production increases dramatically after parturition, imposing new burdens on the animal, which must match its feed intake requirements with the production requirements to produce large volumes of milk. In most cases, the equation of intake versus output does not balance, causing animals to use stored energy reserves to match the high milk production, resulting in a period of negative energy balance (NEB), where animals expend more energy than is consumed. NEB will continue to exist until milk production decreases or feed intake increases to meet needs. Parallel to NEB activity, ovarian activity (which was relatively dormant in the later stages of gestation) increases, but is significantly influenced by the NEB environment.

The main factors influencing ovarian function at this time are insulin and oestrogen. At this time, the main factors influencing ovarian function are insulin, growth hormone (GH), insulin-like growth factor-I (IGF-I), glucose, and luteinizing hormone (LH) [5]. In most cases, GH and IGF-I are 'coupled,' meaning that GH stimulates an increase in liver IGF-I secretion, which then decreases GH via negative feedback. However, insulin concentrations remain low during NEB, preventing an increase in liver GH receptors as well as IGF-I secretion; in this situation, increasing GH does not increase IGF-I, and the somatotropic axis is considered uncoupled. Insulin and IGF-I are important because they normally work together with LH and follicle-stimulating hormone (FSH) to stimulate the development of ovarian follicular cells, which leads to ovulation [6]. Upto 50% of modern dairy cows have aberrant post-partum oestrous cycles (including 10% to 50% with anovulatory anoestrus), resulting in longer calving intervals and [7] lower conception rates [8].

Through proper nutrition and pre-partum nourishment, cows can be managed to have a shorter, and less severe, period of NEB, allowing for early resumption of ovarian activity, first ovulation, and oestrous cycles, all of which have been linked to increased uterine health and subsequent fertility [9,10].

NUTRITIONAL INFERTILITY

Fertility is most affected by postpartum diet. Fertility diminishes when TDN levels are low both pre and postoperatively. Vitamin A had no effect on fertility, however it did induce irregular cycles in some people. Vitamin D insufficiency inhibits estrus and causes ovulation to be delayed. Vitamin E insufficiency has been linked to issues with reproduction. Cows may have reduced conception rates if their blood urea nitrogen (BUN) level is higher than 20 mg/dl. Excess dietary protein is the cause of the excessive BUN. Anemia related to anaplasmosis, internal or external parasites, and protein, iron, copper, cobalt, or selenium deficiencies can all produce true anoestrus, or a lack of ovarian activity. Phosphorus deficit, energy deficiency, and cows losing flesh due to high output and/or underfeeding can all affect reproduction.

Metritis may be caused by a lack of selenium or vitamin E. Vitamins and minerals are frequently implicated in infertility and anestrus, but there is little hard evidence to back up these claims. The use of urea has no effect on reproduction. The Corpus Leutem (CL) requires carotene; if it is deficient, the cow may have low progesterone and irregular cycles. Copper is required at a concentration of 10 ppm. Anestrus may occur if the level is lower than this. A cobalt deficiency, on the other hand, may result in a delayed first estrus and irregular heats. Manganese is required at a level of 40 ppm. Lower levels may result in anestrus or irregular heats. It is difficult to separate phosphorus from energy. It is associated with the plant's seed portion.

Transitional period managements

- Physiological change
- Metabolic change
- Nutritional change

Management and monitoring

- Before calving 2-3 weeks
- Calving period
- Post-caving period 2-3 weeks

Transitional periods monitoring

- Body condition score management (BCS)
- Negative energy balance (NEB).
- Milk fever and subclinical hypocalcaemia.
- Rumen health
- Trace elements and antioxidant status

Nutrition

By feeding cows after they calving, one cannot expect to improve the number of cycles. It is simple to maintain acceptable pre-partum condition by giving good pre-partum nutrition, so the stress of postpartum nursing generates a shorter time of negative energy balance. In addition to care, a growing heifer requires additional nutrients for growth. Pregnant heifer: demand rises even more (FOETAL FACTORS). Additional nutrients are required for milk production by pregnant animals in lactation, but only during the last third of pregnancy. In addition to the maintenance requirements, 50% more nutrients must be fed.

Body Wt. (Kg)	DM (Kg)	CP (g)	TDN (kg)	ME (Mcal)	Ca (g)	P (g)
250	5.0	335	2.75	9.9	22	14
300	6.0	400	3.30	11.9	24	16
350	7.0	470	3.85	13.9	26	18
400	8.0	535	4.40	15.8	28	20

Table a: Daily maintenance requirements of mature cows/buffaloes.

Body Wt. (Kg)	DM (Kg)	CP (g)	TDN (kg)	ME (Mcal)	Ca (g)	P (g)
250	6.25	415	3.00	12.40	30	18
300	7.50	500	3.40	15.00	30	18
350	8.75	585	3.70	17.25	32	20
400	10.00	670	4.00	19.80	32	20

Table b: Pregnant cows, last two months of gestation**.**

Stress

It is one of the environmental elements that affects livestock handling and production. It is regarded the most important component that should be controlled in animal production units, as it is strongly associated to diseases and infectious agents that may threaten animal health. Adaptation processes in mammals are regulated by the release of hormones such as adrenocorticotropin Under stress, progesterone has a negative feedback effect on luteinizing hormone (LH), increasing the first. There are changes in the release of LH when there are elevated cortisol levels and subsequent depression. Prostaglandin F2 alpha (PGF2) and ACTH levels rise. Epinephrine and norepinephrine levels rise as well [11].

All of this has a negative impact on mammalian reproductive function [12]. The preovulatory follicle is an important component of the reproductive system, and its dysfunction during heat stress may cause other reproductive effects such as gonadotropin secretion distortion, underdevelopment of the body luteum and embryo, and low fertility. (ACTH), glucocorticoids (GH), and catecholamine (CA), with the amount of release varying depending on the nature and intensity of the stress.

According to studies conducted under *in vitro* circumstances, pregnant domestic females exposed to high ambient temperatures and humidity, which are common throughout the summer months, can upset the balance between biochemical and endometrial elements important for pregnancy preservation [13]. In summer, the lipid composition of oocyte membranes deteriorates more than in winter [14]. The possible use of antioxidants to boost the strength of both the oocyte and embryo is an important part of counteracting the effect of heat stress on the quality of oocyte and embryo development. When compared to females under heat stress, pregnancy rates improved when they were cooled for 2 to 30 days after the pregnancy. Furthermore, it was shown that thyroxine and triiodothyroxine can help to minimise heat stress [15].

Only 10% to 20% of inseminations can result in normal pregnancies during periods of extreme heat stress, according to studies [16]. Conception rates in Israel can reach more than 50% during the winter, but can drop to as low as 20% during the summer [17]. The Jersey breed of cattle has been discovered to be more resistant to heat stress than the Holstein variety. According to research conducted in the United States, Holstein and Jersey cows set in heat only display signs of estrus for 12 to 13 hours, which is 5 to 6 hours less than the average period of estrus in warm locations. Other studies have found that during the summer, when temperatures and humidity are high, pregnancy rates drop to 10% [18].

The following are the best ways to manage the symptoms of heat stress

- Physical changes to the environment
- Breeding races that are less susceptible to heat stress, and
- Proper feeding.

Infertility management

- Inseminate at appropriate time of the heat.
- Repeat AI may be required in cases of prolonged heat for conception to occur.
- Close observation is required to detect silent heat, especially in buffaloes.
- Provide proper nutrition right from birth of the animal.
- Provide adequate quantities of mineral mixture.
- Reduce heat stress on the animal by providing clean drinking water at all times and adequate shade or cooling systems.
- Ascertain whether the personnel providing AI services is adequately qualified.
- Consult a veterinarian if a regularly cycling animal has not conceived even after 3 inseminations to identify the problem. Repeated inseminations may cause permanent damage to the reproductive organs.
- Animals with anatomical conditions may not conceive.
- Infection/diseases of reproductive tract also may lead to infertility. Consult a veterinarian for proper advice and treatment.

Conclusion

By only thorough investigations of management and health examination it is possible to detect infertile, sub fertile and sterile animals. There are different aspects such as nutrition, management and infectious agents that affect the infertility. Nutritional aspects includes, green fodder, balanced feeding, mineral supplementation.

Managemental aspects includes breeding policy, timely detection of estrus, care of pregnant animals, care of post parturient dams, vaccination schedule for important diseases. Infections include bacterial, viral, protozoal and fungal infections affecting genital tracts.

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