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REVIEW ARTICLE

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REPEAT BREEDING SYNDROME AND ITS MANAGEMENT IN DAIRY CATTLE OF JAMMU AND KASHMIR: A REVIEW

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ABSTRACT

Repeat breeding in cows is a multifactorial reproductive disorder characterized by failure to conceive after three or more regular estrous cycles despite normal mating or artificial insemination, without apparent clinical abnormalities. Repeat breeding syndrome in cattle is a major reproductive disorder causing reduced fertility and significant economic losses to the dairy industry. The condition is multifactorial in nature and may result from infectious agents, hormonal imbalances, nutritional deficiencies, genetic predispositions, and improper management practices such as inaccurate detection of estrus or poor insemination techniques. Both clinical and subclinical endometritis are significant causes, as uterine infections impair the uterine environment, disrupt embryonic development, increase embryo mortality, and prevent successful conception. Congenital and acquired abnormalities of the genital tract, such as defects in the oviduct or uterus, can hinder sperm transport, fertilization, or embryo implantation. Imbalances in hormones, including low levels of FSH, progesterone, and luteinizing hormone (LH), or improper ovarian function (e.g., cystic ovarian degeneration), negatively affect ovulation, corpus luteum formation, and the establishment of pregnancy. Deficiencies in critical minerals (e.g., zinc, selenium, and vitamin E) and improper nourishment lead to poor reproductive health, suboptimal body weight, and increased risk of repeat breeding. Other factors include Genetic predisposition, maternal age (higher repeat breeding rates in older cows), improper estrus detection, poor management, and early embryonic death also contribute to repeat breeding. Diagnosis can be achieved through recto-genital palpation, ultrasonography, uterine cytology, and laboratory testing. Effective management involves treating reproductive tract infections, correcting nutritional and hormonal imbalances, and improving breeding practices. Addressing repeat breeding comprehensively is essential to improving conception rates, minimizing economic losses, and enhancing overall herd productivity.

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INTRODUCTION

Reproduction is one of the most critical pillars supporting the sustainability and profitability of the dairy industry. The economic success of dairy farming largely depends on the ability of cows to produce one healthy calf each year, which in turn ensures optimum lactation and steady milk yield. A well-functioning reproductive system in cattle not only enhances productivity but also reduces unnecessary management costs, improves genetic progress, and strengthens the overall efficiency of the dairy sector. Conversely, poor reproductive performance is one of the major factors limiting profitability in both smallholder and commercial dairy enterprises. Repeat breeding is recognized as a major reproductive disorder within the dairy sector, characterized by cows or heifers displaying normal estrous cycles but failing to conceive after three or more consecutive artificial inseminations or matings, without any detectable clinical

abnormalities in their reproductive tract. Repeat breeding females return to service repeatedly after being bred with a fertile male. This condition affects a significant proportion of dairy herds worldwide, with incidences reported as high as 30% under certain management systems, and is a persistent impediment to farm profitability and efficiency. Repeat breeding syndrome, which causes significant financial losses for dairy farmers, is still a serious issue in cattle and buffalo breeding (Bartlett *et al.*, 1986). Given its profound economic and biological implications, repeat breeding continues to attract the attention of veterinarians, researchers, and dairy producers. Understanding its causes, consequences, and management strategies is crucial for enhancing reproductive efficiency and ensuring the long-term profitability of the dairy industry. The prevalence of repeat breeding is much greater in crossbred cows (17.57%) as compared to buffaloes (12.74%) and indigenous cows (8.64%) (Verma *et al.*, 2018). Repeat breeding cows are a diverse group of subfertile cows

with no illnesses or structural abnormalities, but they nevertheless are unable to conceive even after at least two inseminations. The repeat breeding occurrence in cattle is 5-32%, and in the case of buffalo, it is 6-30% (Gupta *et al.*, 2005). The etiological basis of repeat breeding is complex and multifactorial. Key contributing factors include anatomical defects, subclinical uterine infections (such as endometritis), hormonal imbalances disrupting ovulation and early embryonic development, nutrition, and management shortcomings in heat detection and breeding technique. Age, parity, body condition, intensive production systems, and inadequate animal husbandry also play a significant role in predisposing certain individuals to become repeat breeders. Genetic susceptibility, stress, and environmental factors further complicate the identification and prevention of this syndrome.

Anatomical defects: Major anatomical defects include oviduct occlusion/stenosis, kinked cervix, cervical abnormalities, congenital defects of the genital tract, and abnormal vulvar conformation. Anatomical defects are significant contributors to repeat breeding in cattle, causing difficulties in conception even when other reproductive parameters appear normal. These defects typically involve reproductive tract anomalies that interfere with fertilization or embryo development. Defects in oviducts, such as tubular stenosis or occlusions, have been associated with repeat breeding. Oocytes and spermatozoa cannot pass through the oviducts due to these conditions, and if fertilization takes place, the embryo's transit into the uterus will be challenging. The estrous cycle of cows with oviduct abnormalities is unchanged, displaying a typical duration. These problems can occasionally be rectified on their own. Oviductal obstructions that probably prevent fertilization can originate from pathologies in the oviduct, such as hydrosalpinx, pyosalpinx, salpingitis (Vala *et al.*, 2011), and stenosis or growths in the oviduct (G.N. Purohit 2014); however, most studies have utilized abattoir-derived genitalia, and clinical descriptions are few. The incidence of ovaro-bursal adhesions has also been reported in few clinical descriptions with a percentage of 0.04 to 6.4% (O.I. Azawi *et al.*). Anatomical defects are more commonly observed in heifers than in older cows and can be a consequence of traumatic or difficult calving. These defects may account for a significant percentage of repeat breeding cases, making them critical to address in herd reproductive management. A kinked cervix impairs sperm passage, and it can be detected through transrectal palpation.

Anatomical defects in repeat breeding cattle can be diagnosed using a combination of clinical and advanced veterinary techniques, with some defects being more difficult to detect than others. Key diagnostic methods are transrectal palpation, vaginoscopy, ultrasonography, and reproductive tract cytology. Anatomical defects in cattle can be corrected surgically using specific procedures tailored to the nature and location of the defect. Common approaches include laparotomy, laparoscopy, suture techniques, and reconstruction of the affected organ or tissue (Silva CRG *et al.*, 2023). Most anatomical defects are difficult to detect through routine examination but can sometimes be identified using advanced clinical methods like transrectal palpation and vaginoscopic examination.

Subclinical Endometritis: Diagnosis and Impact: The effectiveness of livestock production is mainly dependent on reproduction. Uterine infections that result in reproductive abnormalities can increase the time between calving and pregnancy, which can result in large financial losses for dairy farms. One of the prevalent reproductive illnesses that significantly reduces the livestock industry's profitability is endometritis. Endometritis is an inflammation that occurs in uterine mucosa, which is the inner layer of the uterine wall. It is a major contributor to repeat breeding in cattle because it impairs fertility and leads to repeated unsuccessful inseminations. Endometritis continues to be the leading cause of repeat breeding and is responsible for 46% of the reproductive problems in cattle (CC Pérez-Marín and LA Quintela 2023). The majority of cases of endometritis result from bacterial contamination of the uterine lumen after three weeks of delivery, depending on the balance between host immunity and the extent of microbial and

environmental contamination (TJ Potter *et al.*, 2010). The pathogenic bacteria that are mainly responsible for endometritis include *Escherichia coli*, *Trueperella pyogenes*, *Fusobacterium necrophorum*, *Arcanobacterium pyogenes*, and *Prevotella melaninogenica* (SJ Jeon *et al.*, 2018). Bacterial infection enters through the vagina, progresses through the cervix, and contaminates the uterus, which leads to endometritis. Reproductive performance of cattle is negatively impacted by endometritis, which can result in either temporary or permanent reproductive abnormalities. Endometritis can be classified into two types: subclinical endometritis (SCE) and clinical endometritis (CE). Subclinical endometritis is characterized by an increased percentage of polymorphonuclear (PMN) cells in the endometrium without any clinical signs of disease. The presence of threshold PMNs on cytological examination, which indicates inflammation of the uterine endometrium, without purulent material in the vagina, is a characteristic of subclinical endometritis in cattle. In case of clinical endometritis, there is the presence of purulent or mucopurulent vaginal discharge after three weeks or more postpartum (OB Pascottini *et al.*, 2016). Cows usually do not show any outward signs or symptoms. The primary signs of endometritis include an enlarged uterus and increased cervical diameter as well as purulent discharge. Endometritis is one of the leading causes of reproductive problems, including anestrus and repeat breeding. It is also responsible for decreased fertility in cows, retained placenta, puerperal metritis, pyometra, and other nonspecific infections (G. Gautam *et al.*, 2009). Cows with endometritis show a decrease in pregnancy rates by about 16% (K. Wagener, *et al.*, 2021).

Endometritis can spread by various sources, including retention of fetal membranes, assisted birthing processes, contamination from dead calves, microbes entering the uterus during delivery, and dystocia. Poor sanitation might lead to a rise in the microbial load of the uterus during delivery. One of the main significant risks for endometritis is the retention of placental membranes. The placental membranes are the ideal growing environment for the bacteria. The other risk factors include ketosis, milk fever, stillbirths, and multiple births (J. Dubuc *et al.*, 2010). Negative energy balance promotes development of various metabolic diseases like ketosis, which can raise endometritis risk factors by 6.1 to 9.5 times (M. Adnane *et al.*, 2017). Endometritis is not a medical emergency, but treatment is essential for enhancing the reproductive efficiency of the animals. If the normal estrous cycle is successful in clearing the estrus, endometritis may heal on its own. However, systemic treatment is necessary to get the cow back to normal. The standard treatment for endometritis includes uterotonics, NSAIDs, and antibiotics. Most frequently used antibiotics include ampicillin, amoxicillin, tetracycline, sulphonamides, and ceftiofur (Z. Várhidi *et al.*, 2024). NSAIDs widely used include flunixinmeoglumine, ketoprofen, and meloxicam. Hormones like oxytocin can be utilized within the first few hours following delivery. Prostaglandins can be used after 3rd day of parturition with an additional advantage of inducing the estrus due to presence of corpus luteum that responds to PGF_{2α} (M. Noguchi *et al.*, 2017)

Hormonal Dysfunction: Hormonal dysfunction accounts for a large portion (about 40%) of repeat breeder cases. Delayed ovulation, anovulation, and luteal insufficiency are the main functional causes of repeat breeding in dairy cattle. Hormonal dysfunction is a key contributor to repeat breeding in cattle, mainly involving deficiencies or imbalances in reproductive hormones such as progesterone, FSH, and LH. Low or delayed progesterone levels after ovulation can lead to failure of embryo implantation or early embryonic death, commonly observed in repeat breeder cows. Significantly lower plasma FSH is found in repeat breeders, affecting follicular development and ovulation. Delayed or insufficient LH surge leads to delayed ovulation, missed timing with insemination, and reduced conception rates. GnRH action or secretion failure leads to poor stimulation from the hypothalamus, which may decrease LH and FSH secretion, further aggravating ovulatory and luteal function problems. Mineral deficiencies Particularly zinc, which affects GnRH, LH, and FSH secretion and can indirectly cause hormonal imbalances. Various hormonal treatments have been formulated for the treatment of

functional causes of repeat breeding. Administration of GnRH at the time of insemination leads to ovulation by directly acting on the pituitary and stimulating the secretion of gonadotropins such as LH and FSH and promoting the preovulatory LH peak, which is essential for follicular dehiscence. Exogenous gonadotropins are used in repeat breeding cows to induce ovulation and exert the luteotropic effect on CL. Administration of pregnant mare serum (PMS) on day 15 or 16 of the estrous cycle, obtaining a conception rate of 73.9 % in repeat breeding cows compared with 44.4% of control cows (Roussel *et al.*, 1995). Treatment with HCG on day 5 after insemination can achieve higher levels of progesterone for at least 2 weeks due to the development of accessory CL (Walton *et al.*, 1990). GnRH analogues, like buserelin acetate and single insemination, are sufficient methods for treating prolonged estrus in repeat-breeding cattle, although double AI at 24-hour intervals also gives the best results in the absence of hormonal treatment (Sharma *et al.*, 2006). GnRH administration leads to induction of ovulation. It has been found that the administration of progesterone as of 3 to 5 days after insemination and for 2-3 weeks (or more) improves conception rates in repeat breeding cows. Due to the significance of low fertility in dairy cows, synchronizing ovulation of the dominant follicle (DF) before fixed-time artificial insemination (FTAI) in dairy cows has been accomplished using a hormonal treatment using a short-term 5-day progesterone (P4)-prostaglandin F2 (PGF)-gonadotropin-releasing hormone (GnRH)-based protocol (Yama *et al.*, 2022). Prostaglandins are also used for the treatment of repeat-breeding cows due to their luteolytic effect on CL. Treatment with PGs aims to achieve better heat detection and to increase the number of cows in heat. There are various treatment protocols used in cattle; one way is to administer two PGF2 α injections 12 days apart and insemination 80 hours later. Sometimes intravenous PGF2 α has also been reported in repeat breeding cows at the time of AI. Ovsynch is a protocol based on the administration of GnRH, PGF2 α , and GnRH for the treatment of cows with silent heats or ovulation problems. In anovulation cases ovulation will not be evident, and hence no CL will be felt on days of examination. The hormonal therapy includes hCG or LH preparations of 1500 to 3000 IU I/V on the day of AI or GnRH, i.e., Receptal or Fertagyl 500 μ g I/M on the day of AI. Proluton depot 250 mg I/M at AI and 25% Dextrose 400 ml I/V + Inj. Vitamin C 200 mg on the 5th and 17th can also be tried.

Nutritional Problems: Nutritional deficiency plays a significant role in repeat breeding in cows, with deficits in key minerals and vitamins linked to subfertility, poor conception rates, and reproductive dysfunction. The rate of conception of the cows is associated with body weight and 240-275 kg for HF cross heifers. Both underweight and overweight animals show poor rates of conception; optimal BCS supports fertility. Balanced feeding is essential in maintaining normal reproductive functions in cattle. Mineral deficiencies, like low levels of sodium (Na), potassium (K), selenium (Se), copper, zinc, phosphorus, and manganese, have been specifically found in repeat breeder cows. Insufficient Vitamins A, D, and E impair immune function and reproductive health, and their supplementation is associated with improved fertility outcomes. Suboptimal dietary protein and energy can lead to anestrus, silent heat, and poor ovulation, further exacerbating repeat breeding issues. Deficiencies of minerals also disrupt hormone release required for successful ovulation, fertilization, and early embryonic development, including progesterone and estrogen. Deficits in trace minerals like selenium and zinc decrease immune response and increase early embryonic loss. Se deficiency is related to poor growth, health, and reproductive problems such as irregular estrus, poor uterine involution, abortion, and cystic ovaries (Mohammed *et al.*, 1991). Repeat breeders show lower Na, K, and Se and higher toxic elements (Cd) compared to fertile cows, making them vulnerable to endocrine and reproductive disturbance. Using a balanced ration with adequate energy, protein, and trace minerals (Ca, P, Mg, Cu, Zn, Se) significantly improves conception rates, dominant follicle size, hormone levels (estradiol), and general health of cows compared to traditional rations. Supplementation of essential vitamins such as vitamins A, D, and E, along with beta-carotene, enhances immune function and progesterone synthesis, reduces luteal hypofunction, and boosts estrus

expression. Vitamin E and selenium especially help in supporting embryo survival and uterine health. Inclusion of polyunsaturated fatty acid (PUFA) sources like fish oil for 2 weeks before and after insemination improves uterine and ovarian function, increases progesterone, and supports embryonic survival. Maintaining a positive energy balance and avoiding excessive rumen degradable protein improves ovulation, embryo development, and overall reproductive performance. Mineral mixtures containing selenium, zinc, copper, manganese, and beta-carotene during the breeding period can support the estrus cycle and corpus luteum formation and can improve breeding rates.

Artificial insemination: Artificial insemination (AI) is closely linked to repeat breeding in cattle, as improper timing, technique, and semen quality are major causes of failed conception and repeat breeder syndrome. Optimal bull fertility, either by natural mating or AI, is necessary to achieve higher pregnancy rates. Timing of insemination and accurate heat detection are crucial. Ensure AI is performed at the right time after observed estrus. Failure to inseminate at the optimal estrus period leads to missed fertilization and increases the risk of repeat breeding. Improper semen handling, semen storage, or selection can cause reduced conception rates. Ensuring semen viability and proper thawing are essential for maintaining higher conception rates. The oviducts are where fertilization takes place for sperm that has recently been ejaculated into the vagina by the bull or implanted into the uterus by the inseminator. Inaccurate placement of semen, poor hygiene, or rough handling contribute to uterine inflammation and fertilization failure. Repeating AI at 24-hour intervals may improve outcomes in the absence of hormonal protocols. The AM/PM rule, which involves insemination in the morning if the cow was in heat the previous evening or in the afternoon if the heat was discovered in the morning, is the most widely used procedure on dairy cattle farms

Economic Impact of RBC Syndrome: Repeat breeding is considered as one of the most significant reproductive issues on dairy farms, alongside other problems like anoestrous, ROP, dystocia, abortion, and uterine prolapse. Repeat breeding causes major financial losses due to increased veterinary cost, extra semen cost, increased expenses for therapeutic drugs, increased labor cost, decreased milk yield, reduced calf production, losses due to increased culling percentage and replacement, and losses resulting from extra calving intervals. Failure to conceive is described as one of the main reasons for culling cows. In dairy cows, maximum milk production is usually achieved around the fourth and fifth lactation. Therefore, early culling does not take full advantage of the milk production potential of the animal. Repeat breeding leads to reduced productivity in terms of a greater number of days open, increased calving intervals, decreased calving rates, and subsequently lower milk production and fewer calves born throughout the animal's lifetime. The increased direct cost of repeat breeding syndrome is higher than many other common reproductive disorders. The diagnosis of RBC syndrome is complex, and the required methods for an accurate diagnosis may be too expensive to be carried out individually.

Measures adopted to reduce the incidence of repeat breeding in cows

- Early and accurate estrus detection is critical; observing cows for signs of heat multiple times a day increases conception rates.
- Applying the "A.M.-P.M. Rule" for insemination of cows in heat. If cows show estrus signs in the morning, they should be inseminated in the evening, and those in evening heat should be inseminated the following morning.
- Ensure inseminators are well-trained, maintain semen quality, and follow proper hygiene protocols during AI
- Diagnosis, treatment, and prevention of SCE is important, as it is considered a "silent cause" of RBC syndrome.
- Minimize the occurrence of periparturient diseases and the duration of negative energy balance in cows.

- Cows with anoestrus, ovulatory problems, inadequate LH production, and subfunctional CL can be treated with GnRH, hCG, PGF2 α .
- Estrous synchronization programs with progesterone supplementation or Double Ovsynch improve conception rates in problem cows.
- Maintain proper nutrition with balanced rations, and regularly monitor body condition score (BCS) and body weight for signs of undernutrition or excess.
- Prevent excessive negative energy balance (NEB) after calving, and provide high-quality forage and mineral supplementation.
- Reproductive management practices, such as AI skills, hygiene during AI, and semen quality, should be regularly checked and improved.
- Ensure cow comfort by providing good housing, minimizing stress, and promoting proper milking routines.
- Regular herd health monitoring and adjusting management based on herd reproductive statistics lower risk of repeat breeding syndrome.

REFERENCES

- Bartlett PC, Kirk JH, Mather EC. Repeated insemination in Michigan Holstein-Friesian cattle: Incidence, descriptive epidemiology and estimated economic impact. *Theriogenology*. 1986;26(3):309-322.
- Pérez-Marín CC and LA Quintela. Current insights in the repeat breeder cow syndrome. *Animals* 2023; 13(13), 2187.
- Gautam, G T Nakao, M Yusuf and K Koike. Prevalence of endometritis during the postpartum period and its impact on subsequent reproductive performance in two Japanese dairy herds. *Animal Reproduction Science* 2009; 116(3-4), 175-187.
- Purohit G.N. Ovarian and oviductal pathologies in the buffalo: occurrence, diagnosis and therapeutic approaches *Asian Pac J Reprod*, 3 (2014), pp. 156-168
- Graden AP, Olds D, Mochow CR, Mutter LR. Causes of fertilization failure in repeat breeding cattle. *Journal of Dairy Science*. 1968;51(5):778-781.
- Gupta AG, Deopurkar RL. Microbial study of gynaecological infection in cattle. *IJAR*. 2005;14:118-119.
- Dubuc, J TF Duffield, KE Leslie, JS Walton and SJ LeBlanc. Risk factors for postpartum uterine diseases in dairy cows. *Journal of Dairy Science* 2010; 93(12), 5764-5771.
- Wagener, K M Drillich, C Aurich and C Gabler. Endometrial inflammation at the time of insemination and its effect on subsequent fertility of dairy cows. *Animals* 2021; 11(7), 1858.
- Vala, K.B. M.T. Panchal, D.J. Ghodsara, K.K. Hadiya, B.J. Trangadia, A.A. Vagh Studies on histopathological changes in genitalia of culled buffaloes (*Bubalus bubalis*) *Indian J Vet Pathol*, 35 (2011), pp. 197-199
- Adnane, M R Kaidi, C Hanzen and GCW England. Risk factors of clinical and subclinical endometritis in cattle: A review. *Turkish Journal of Veterinary and Animal Sciences* 2017; 41(1),
- M Noguchi, M Hirata, H Kawaguchi and A Tanimoto. Corpus luteum regression induced by prostaglandin F2 α in microminipigs during the normal estrous cycle. *In Vivo* 2017; 31(6), 1097-1101.
- Mohammed HO, White ME, Guard CL, Smith MC, Mechor GD, Booker CW, et al. A case-control study of the association between blood selenium and cystic ovaries in lactating dairy cattle. *J Dairy Sci*. 1991;74(7):2180-2185.
- Azawi, O.I. A.J. Ali, E.H. Lazim Pathological and anatomical abnormalities affecting buffalo cows reproductive tracts in Mosul Iraq *J Vet Sci*, 22 (2008), pp. 59-
- OB Pascottini, M Hostens, P Dini, J Vandepitte, R Ducatelle and G Opsomer. Comparison between cytology and histopathology to evaluate subclinical endometritis in dairy cows. *Theriogenology* 2016; 86(6), 1550-1556.
- Roussel JD, Stallcup OT, Rakes JM & Ward RF. Treatment of repeat breeders with pregnant mare serum. *J Dai Sci* 1965;48:808.
- Roussel JD, Stallcup OT, Rakes JM, Ward RF. Treatment of repeat breeders with pregnant mare serum. *Journal of Dairy Science*. 1995;48:808.
- Sharma A, Singh M, Vasishta NK. Effect of Gonadotrophin releasing hormone administration on conception rate following artificial insemination in repeat breeder cattle. *Indian J. Anim. Sci*. 2006;76(4):330-332.
- Silva CRG, Cardoso TDS, da Silva KB, Gurgel HJ, Barroso JPM, Araújo LHV, Altamirano LES, de Sousa LA, Alcântara LPA, Ferreira MEM, Carvalho LS, Gonçalves JLDS, Rodrigues JHG, Monteiro FDO, Viana RB, Teixeira PPM. Laparoscopy-assisted percutaneous correction of abdominal wall defects in the umbilical region in a cadaveric model of bovine fetus. *PLoS One*. 2023 May 31;18(5):e0285988. doi: 10.1371/journal.pone.0285988. PMID: 37256883; PMCID: PMC10231838.
- Jeon SJ and KN Galvão. An advanced understanding of uterine microbial ecology associated with metritis in dairy cows. *Genomics and Informatics* 2018; 16(4), e21
- TJPotter, JGuitian, J Fishwick, PJ Gordon and IM Sheldon. Risk factors for clinical endometritis in postpartum dairy cattle. *Theriogenology* 2010; 74(1), 127-134
- Verma, S., Srivastava S, Verma R K, Saurabh, Kumar A and Yadav S K. 2018. Incidence of repeat breeding in cows in and around Kumarganj, Faizabad (Uttar Pradesh), India. *International Journal of Current Microbiology and Applied Sciences*. 7:4860-70.
- Walton JS, Halbert GW, Robinson NA, Leslie KE. Effects of progesterone and human chorionic gonadotrophin administration five days postinsemination on plasma and milk concentrations of progesterone and pregnancy rates of normal and repeat breeder dairy cows. *Canadian Journal of Veterinary Research*. 1990 Jun;54(3):305.
- Yama P, Yadmak C, Sangkate M, Jitjumnong J, U-krit W, Promsao N, et al. In vivo follicular and uterine arterial indices as an indicator of successful hormonal stimulation for inactive ovaries in repeat-breeder crossbred dairy cows using a short-term progesterone-based programme. *Animals*. 2022 Jan 25;12(3):292.
- Várhidi, Z G Csikó, AC Bajcsy and V Jurkovich. Uterine disease in dairy cows: A comprehensive review highlighting new research areas. *Veterinary Sciences* 2024; 11(2), 66.
