2022, Scienceline Publication
World's Veterinary Journal
World Vet J, 12(1): 60-65, March 25, 2022
ISSN 2322-4568
DOI: https://dx.doi.org/10.54203/scil.2022.wvj8

Prediction of Postpartum Vaginal Discharge Duration in Sows

Nguyen Hoai Nam[1], Bui Tran Anh Dao[1*], and Peerapol Sukon[2,3]**

[1]*Faculty of Veterinary Medicine, Vietnam National University of Agriculture, Vietnam*
[2]*Faculty of Veterinary Medicine, Khon Kaen University, Thailand*
[3]*Research Group for Animal Health Technology, Khon Kaen University, Thailand*

*Corresponding author's Email: btadao@vnua.edu.vn; ORCID: 0000-0002-4639-8945
**Corresponding author's Email: sukonp@kku.ac.th; ORCID: 0000-0002-0899-2572

ORIGINAL ARTICLE
pii: S232245682200008-12
Received: 10 January 2022
Accepted: 27 February 2022

ABSTRACT

Prolonged farrowing duration increases stillbirth in piglets and affects maternal health leading to a decrease in the reproductive performance of the sow. The present study aimed to predict the duration of postpartum vaginal discharge (PVD, day) in sows. Data were collected from 204 mixed parity Landrace X Yorkshire sows in a swine farm in Bacninh province, Vietnam. Parity, gestation length, litter size, number of dead-born piglets (NDB), farrowing duration (FD, h), and manual extraction (ME) were recorded. Postpartum vaginal discharge was monitored twice a day until no discharge was detected in two successive observations. Linear regression analysis was used to build the model that best predicted the duration of postpartum vaginal discharge. Results showed that the average duration of postpartum vaginal discharge was 3.3 ± 1.6 days. The final multiple linear regression selected manual extraction, farrowing duration, and the number of dead-born piglets as the most significant factors for the prediction of postpartum vaginal discharge duration. All of these three factors were positively associated with PVD. This study indicated that the duration of postpartum vaginal discharge can be predicted. Shortening the farrowing duration, which may reduce the NBD, lowering the rate of manual extraction can be some of the approaches to decrease the duration of postpartum vaginal discharge. Moreover, the results of this study suggested that suitable postpartum treatments such as antibiotics and anti-inflammatory drugs, and care should be provided to the sows with a high risk of prolonged postpartum vaginal discharge to shorten this period.

Keywords: Farrowing duration, Manual extraction, Sow, Vaginal discharge

INTRODUCTION

After farrowing, the uterus continues to contract in order to expel placental remnants and inflammatory and/or infection products through the vagina to the outside of the body. The normal postpartum vaginal discharge (PVD) duration in the sow may vary from 3 to 4 days. Previous studies reported that the average PVD was 4.3 days (Nam, 2020) and 4.5 days (Nam, 2019a). Under the condition of uterine infection, PVD can be prolonged as it was found that about 17.4-23.7% of the sows had a PVD longer than 6 days (Waller et al., 2002). A PVD above 6 days has been found to decrease conception rate, farrowing rate, total born, and the number of born alive (Waller et al., 2002). Increased PVD also prolongs the weaning to first service interval (Nam, 2019a), and tends to increase the incidence of diarrhea in suckling piglets (Nam, 2019b).

Some factors affecting PVD in swine have been identified in previous studies. Tummaruk and Sang-Gassanee (2013) found that 5-7 parity sows had a higher risk of developing postparturient vaginal discharge in comparison with 2-4 parity sows. It has been also reported, via multivariate logistic regression analysis, that manual extraction, farrowing duration, parity, stillbirth, and postparturient body temperature were all associated with the incidence of prolonged postparturient vaginal discharge (Nam, 2020). Nonetheless, no information on the prediction of PVD in sows is available.

Once the PVD is predicted, sufficient treatments and care can be provided to sows at a high risk of experiencing this disorder to shorten the duration of postpartum vaginal discharge and thereby reducing potentially harmful effects of prolonged PVD on the reproductive performance of the sows (Waller et al., 2002). Therefore, the present study aimed to predict the postpartum vaginal discharge duration in sows.

MATERIALS AND METHODS

Ethical approval

This observational study did not involve sample collection, and all procedures used were routinely conducted on this farm, therefore ethical approval was waived from the animal care and use committee of the Vietnam National

To cite this paper: Nam NH, Anh Dao BT, and Sukon P (2022). Prediction of Postpartum Vaginal Discharge Duration in Sows. *World Vet. J.*, 11 (2): 60-65. DOI: https://dx.doi.org/10.54203/scil.2022.wvj8

University of Agriculture. All animal handling practices followed the guidelines for the treatment of animals by the animal care and use committee of the Vietnam National University of Agriculture.

Animals

This study enrolled 204 farrowing of 204 mixed parity Landrace × Yorkshire crossbred sows with an average age of 22 months old from a commercial swine farm in Bacninh province, Vietnam. Pregnant sows were housed in individual gestation crates. The gestation crates were in 220 cm in length and 60 cm in width. About a week before farrowing, sows were moved to the individual farrowing pens which were divided into farrowing crates in the center for sows and creep areas for piglets at both sides of the farrowing crates. The farrowing crates had the same size as the gestation crates. Both two types of crates had slatted concrete floors. The creep area for the piglet was covered with a plastic slatter. In one corner of the creep area, a warm place for piglets was heated by an infrared lamp during the first week after farrowing. The temperature at the gestation and farrowing rooms ranged between 23-30^{0}C, while that in the piglets' places was 32-35^{0}C. The humidity in the gestation and farrowing crates was 70-85%. Sows were bathed twice per day. During the gestation, sows were fed twice a day. Depending on gestation stage and body condition, sows daily received 1.8-3.5 kg of an industrialized pelleted feed. At the first 84 days of gestation, sows were fed 1.8-2.5kg, the feed was increased to 3.0-3.5kg during 85-110 days of gestation. From day 111 of gestation until farrowing, sows received feed in a reduction pattern. Lactating sows were fed increasingly to ad libitum level which normally started from day 6 postpartum. Sows received water from a bite nipple system. Vaccination against classical swine fever (week 10 of gestation), foot and mouth disease (week 12 of gestation), porcine reproductive and respiratory syndrome (2 times per year), Aujeszky's disease (2 times per year), and parvovirus disease (10 days postpartum) were conducted in all sows. Sows were removed to farrowing crates about 7 days before the estimated parturition date. The study only include sows with a normal appetite who were clinically healthy. The period of study was from February to July 2020.

Data collection

Milk letdown and vulva swelling were monitored for planning parturition supervision. All sows were supervised continuously during the parturition. Parity, gestation length, litter size (total born), number of born dead piglets (NBD) (included stillborn and mummified piglets), farrowing duration (FD, hour), and manual extraction (ME) were recorded. Stillborn piglets were not distinguished from mummified piglets because both of them were classified as dead-born piglets. Manual extraction usually occurred when a birth interval exceeded 45 minutes. During farrowing, a sow might need manual extraction more than once. Oxytocin (20 IU) was daily administered to all sows for 3-5 days postpartum. All postpartum sows received 3 doses of antibiotic injections in the neck (Amoxicillin trihydrate, Amoxisol L.A. Bayern, Vietnam, 15 mg/kg) at a 2-day interval starting from the end of parturition (Nam, 2020). Vaginal discharge was checked twice a day before crate cleaning in the morning and afternoon until no discharge was noticed in two successive observations. The PVD (day) was then calculated as the interval between the birth of the last piglet and the time of the first observation with no vaginal discharge.

Statistical analysis

Linear regression was used to determine factors that explained the duration of vaginal discharge. At first, univariate analysis was conducted for individual independent variables, and variables that had a p-value < 0.1 were retained for multiple linear regression analysis. Second, multiple linear regression was run in a forward pattern to determine the final model that best explained the PVD in sows. A p-value < 0.05 was set as the significance level in the multiple linear regression analysis. All tests were conducted in the SPSS program (Statistical Package for the Social Sciences, IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.).

RESULTS

The descriptive statistics of investigated sows were presented in Table 1. The mean vaginal discharge duration in the studied sows was 3.3 ± 1.6 days ranging from 1 to 6.5 days. During the parturition, 16% of sows needed manual extraction for birth assistance and 50% (102/204) of sows had at least one dead-born piglet. The rate of dead-born piglets was 8.1% (218/2696). The gestation length was 115.6 ± 1.7 days varying between 112 and 127 days, and farrowing duration was 3.2 ± 1.8 hours varying in the range of 0.5-12 hours.

Pearson's correlation between independent variables was presented in Table 2. All correlations between independent variables were very low to low ranging from 0.161 to 0.496. Univariate analysis showed that all investigated factors were significantly associated with PVD in the studied sows ($p < 0.1$, Table 3). Therefore, all of these factors were used for multiple linear regression analysis for the prediction of PVD. The final multiple linear regression model consisted of three factors, including manual extraction, farrowing duration, and the number of born dead piglets (Table 4). All of these three factors were positively associated with PVD depicted in the final equation that is PVD = 2.385 +

To cite this paper: Nam NH, Anh Dao BT, and Sukon P (2022). Prediction of Postpartum Vaginal Discharge Duration in Sows. *World Vet. J.*, 11 (2): 60-65. DOI: https://dx.doi.org/10.54203/scil.2022.wvj8

0.938*ME + FD*0.173 + 0.161*NBD. The final model had an R^2 of 0.187. All the variance inflation factors were small (≤1.312), therefore multicollinearity was not a concern.

Table 1. Descriptive statistics of 204 studied sows in a commercial swine herd in the North of Vietnam

Parameters	Mean ± SD	Min-Max
Mean ± SD (n=204)		
Parity	2.6±1.9	1-13
Gestation length (day)	115.6±1.7	112-127
Litter size	13.2±3.7	2-26
Number of born dead piglets/litter	1.1±1.6	0-10
Farrowing duration (hour)	3.2±1.8	0.5-12
Vaginal discharge duration (day)	3.3±1.6	1-6.5
Percentage		
Incidence of manual extraction (%)	15.7 (32/204)	
Proportion of litters with born dead piglet(s) (%)	50 (102/204)	
Born dead piglet rate (%)	8.1 (218/2696)	

SD: Standard deviation, min: Minimum, max: Maximum

Table 2. Pearson's correlation between explanatory variables for the duration of postpartum vaginal discharge in the sow

Variables	P	GL	ME	LS	NBD
GL	-.036				
ME	.228**	-.109			
LS	.042	-.125	.089		
NBD	.101	.034	.441**	.344**	
FD	.161*	-.133	.329**	.496**	.341**

P: Parity, GL: Gestation length, ME: Manual extraction, LS: Litter size; NBD: Number of born dead piglets, FD: Farrowing duration (hour). *, ** denoted the significance level at <0.05 and <0.01, respectively.

Table 3. Univariate linear regression analysis of factors associated with postpartum vaginal discharge duration in a commercial swine herd in the North of Vietnam

Covariates	Coefficients	Probability	R-squared
Manual extraction (yes/no)	1.527	<0.001	0.121
Farrowing duration (hour)	0.281	<0.001	0.103
Gestation length (day)	-0.119	0.081	0.015
Number of born dead piglets	0.328	<0.001	0.101
Parity	0.166	0.004	0.039
Litter size	0.101	0.001	0.054

Table 4. Multiple linear regression analysis for prediction of postpartum vaginal discharge duration in 204 sows in a commercial swine herd in the North of Vietnam

Covariates	Coefficients	Probability	VIF
Constant	2.385	<0.001	
Manual extraction (yes/no)	0.938	0.004	1.300
Farrowing duration (hour)	0.173	0.005	1.185
Number of born dead piglets	0.161	0.035	1.312

VIF: Variance of the inflation factor

DISCUSSION

The uterine involution starts at the third stage of parturition which is characterized by the placental expulsion. The placental expulsion is the result of the inflammation process and uterine contraction (Houben et al., 2009; Setyawan et al., 2021). The inflammation of the uterus may be the result of trauma that occurs during the placental detachment, fetal movement, farrowing assistance, and infection with microorganisms (Sheldon et al., 2009; Dubuc et al., 2010). Clearance of placental remnants, products of uterine inflammation, and infection are conducted via vaginal discharge (Sheldon et al., 2009). Although it was reported that different factors were associated with the incidence of prolonged postpartum vaginal discharge in sows (Nam, 2020), the present study has been the first to predict the PVD in this species.

There is a lack of information in the PVD in sows. A previous study reported that the average PVD in 530 sows was 4.3 days which was longer than that in the present study (Nam, 2020). The shorter vaginal discharge duration in the

To cite this paper: Nam NH, Anh Dao BT, and Sukon P (2022). Prediction of Postpartum Vaginal Discharge Duration in Sows. *World Vet. J.*, 11 (2): 60-65. DOI: https://dx.doi.org/10.54203/scil.2022.wvj8

present study may partly be due to a lower mean parity (2.6 versus 3.6 days), a shorter farrowing duration (3.2 versus 4.0 hours), and a smaller proportion of manual extraction (15.7% versus 32.9%), compared to a previous study (Nam, 2020).

The positive correlation between farrowing duration and PVD can be explained via several mechanisms mentioned below. Farrowing is an energy-consuming process (Melo and Peraçoli, 2007), and the longer the farrowing duration the more energy is consumed (Yang et al., 2019). Increased farrowing duration can also increase the incidence of reduced appetite and fever in the sows (Tummaruk and Sang-Gassanee, 2013). These conditions result in energy imbalance and anaerobic metabolism which may subsequently cause ketosis and electrolyte imbalance (Melo and Peraçoli, 2007). Furthermore, farrowing duration is positively associated with manual extraction which may cause damage to the endometrium and may increase postpartum infection due to its suppression of uterine leukocyte phagocytosis (Beagley et al., 2010). Moreover, increased farrowing duration might be a result of impaired oxytocin concentration/activity/receptors (Kimura et al., 2013), and this condition may affect the postpartum placental remnant discharge (Bjorkman et al., 2018). All those above-mentioned conditions can contribute to the positive association between farrowing duration and the length of postpartum vaginal discharge.

The incidence of manual extraction in spontaneous farrowing was 33.8% and could be up to 50-73.6% in hormonal-induced farrowing (Boonraungrod et al., 2018). This rate in a study by Oliveira et al. (2020) was 11.1-16.8% which was very close to the incidence of manual extraction in the present study. Manual extraction might cause damage to the endometrium and bring pathogenic agents into the uterine lumen (Giuliodori et al., 2013). Furthermore, this study showed that manual extraction usually occurred simultaneously with a prolonged farrowing duration. Therefore, damaged endometrium, presence of pathogenic agents, and imbalance of energy/metabolism/electrolytes as discussed above may explain the positive association between manual extraction and PVD.

The association between the number of dead-born piglets and litter size and PVD may be explained through the positive association between these two factors and farrowing duration. A previous study also showed that litter size was positively correlated with farrowing duration (Nam and Sukon, 2020). Dead-born piglets can not actively move in the reproductive tracts thereby increasing the farrowing duration (van Dijk et al., 2005; Taverne and van der Weijden, 2008). Also, the number of dead-born piglets was positively associated with manual extraction. Taken together, PVD was lengthened when the number of dead-born piglets and litter increased.

The positive association between parity and PVD in the present study may be attributable to the positive correlations between parity and farrowing duration and manual extraction and to the changes in anatomy and microecology of the genital tract of the high parity sows. Previous studies have shown that older sows were more likely to have postparturient vaginal discharge (Tummaruk and Sang-Gassanee, 2013). Older sows are also more frequently found to have an unhealthy uterus, cervix, and vagina (Boma and Bilkei, 2006). Furthermore, older postpartum sows are at a higher risk of having a bacterial positive sample collected at the anterior vaginal and cervical area (Bara et al., 1993). Maes et al. (1999) also reported that uterine infection was more common in higher-parity sows than in younger sows. Therefore, PVD increased when parity increased.

It is widely known that gestation length is negatively associated with litter size (Hanenberg et al., 2001; Sasaki and Koketsu, 2007; Rydhmer et al., 2008). This association may be a result of the hormonal-related parturition process (McLaren et al., 2000; Barth, 2014; Raheem, 2017). According to this association, gestation length increases in small litter sizes where the farrowing duration decreases. Therefore, the associations between gestation length and litter size and that between litter size and farrowing duration are the explanation for the negative correlation between gestation length and PVD.

CONCLUSION

The present study showed that PVD in sows can be predicted, and manual extraction, farrowing duration, and the number of dead-born piglets are the most significant factors for the prediction of PVD. Successful prediction of PVD may be beneficial to the farmers and veterinarians in identifying sows at a high risk of having a long PVD, and in providing sufficient treatments and care for these sows to shorten the PVD.

DECLARATIONS

Acknowledgments

The authors are grateful to Luu Thi Thanh Huong and Phan Thi Thanh Huong for their assistance in data collection.

Competing interests

The authors declare that there is no conflict of interest.

To cite this paper: Nam NH, Anh Dao BT, and Sukon P (2022). Prediction of Postpartum Vaginal Discharge Duration in Sows. *World Vet. J.*, 11 (2): 60-65. DOI: https://dx.doi.org/10.54203/scil.2022.wvj8

Authors' contribution

NHN and BTAD collected data. NHN, BTAD, and PS conceived and designed the study, analyzed data, and wrote the manuscript. All authors approved the final manuscript.

Consent to publish

Authors give consent for information concerning the article to be published in the World's Veterinary Journal.

Ethical considerations

Ethical issues (including plagiarism, consent to publish, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy) have been checked by all three authors.

REFERENCES

Bara MR., McGowan, MR, O'Boyle D, and Cameron RD (1993). A study of the microbial flora of the anterior vagina of normal sows during different stages of the reproductive cycle. Australian Veterinary Journal, 70: 256-259. DOI: https://www.doi.org/10.1111/j.1751-0813.1993.tb08043.x

Barth A (2014). Inducing parturition or abortion in cattle. In Hopper RM (editor), Bovine Reproduction. First edition. USA: Wiley-Blackwell, pp. 396-403. DOI: https://doi.org/10.1002/9781118833971.ch44

Beagley JC, Whitman KJ, Baptiste KE, and Scherzer J (2010). Physiology and treatment of retained fetal membranes in cattle. Journal of Veterinary Internal Medicine, 24: 261-268. DOI: https://www.doi.org/10.1111/j.1939-1676.2010.0473.x.

Bjorkman S, Oliviero C, Kauffold J, Soede NM, and Peltoniemi OAT (2018). Prolonged parturition and impaired placenta expulsion increase the risk of postpartum metritis and delay uterine involution in sows. Theriogenology, 106: 87-92. DOI: https://www.doi.org/10.1016/j.theriogenology.2017.10.003

Boma M, and Bilkei G (2006). Gross pathological findings in sows of different parity, culled due to recurring swine urogenital disease (SUGD) in Kenya. Onderstepoort Journal of Veterinary Research, 73: 139-142. DOI: https://www.doi.org/10.4102/ojvr.v73i2.159

Boonraungrod N, Sutthiya N, Kumwan P, Tossakui P, Nuntapaitoon M, Muns R, and Tummaruk P (2018). Control of parturition in swine using PGF2 α in combination with carbetocin. Livestock Science, 214: 1-8. DOI: https://www.doi.org/10.1016/j.livsci.2018.05.012

Dubuc J, Duffield TF, Leslie KE, Walton JS, and LeBlanc SJ (2010). Risk factors for postpartum uterine diseases in dairy cows. Journal of Dairy Science, 93: 5764-5771. DOI: https://www.doi.org/10.3168/jds.2010-3429

Giuliodori MJ, Magnasco RP, Becu-Villalobos D, Lacau-Mengido IM, Risco CA, and de la Sota RL (2013). Metritis in dairy cows: Risk factors and reproductive performance. Journal of Dairy Science, 96: 3621-3631. DOI: https://www.doi.org/10.3168/jds.2012-5922

Hanenberg EHAT, Knol EF, and Merks JWM (2001). Estimates of genetic parameters for reproduction traits at different parities in Dutch Landrace pigs. Livestock Production Science, 69: 179-186. DOI: https://www.doi.org/10.1016/S0301-6226(00)00258-X

Houben ML, Nikkels PGJ, van Bleek GM, Visser GHA, Rovers MM, Kessel H, de Waal WJ, Schuijff L, Evers A, Kimpen JLL et al. (2009). The association between intrauterine inflammation and spontaneous vaginal delivery at term: a cross-sectional study. PloS One, 4: 6572-6572. DOI: https://www.doi.org/10.1371/journal.pone.0006572

Kimura T, Ogita K, Kumasawa KI, Tomimatsu T, and Tsutsui T (2013). Molecular analysis of parturition via oxytocin receptor expression. Taiwanese Journal of Obstetrics and Gynecology, 52: 165-170. DOI: https://www.doi.org/10.1016/j.tjog.2013.04.004

Maes D, Verdonck M, and de Kruit A (1999). Vaginal microecology and vulval discharge in swine. Old Herborn University Seminar Monograph, 12: 39-50. Available at: https://www.old-herborn-university.de/wp-content/uploads/publications/books/OHUni_book_12_article_4.pdf

McLaren W, Young I, and Rice G (2000). Localization and temporal changes in prostaglandin G/H synthetase-1 and -2 content in ovine intrauterine tissues in relation to glucocorticoid¬induced and spontaneous labour. Journal of Endocrinology, 165: 399-410. DOI: https://www.doi.org/10.1677/joe.0.1650399

Melo CRME, and Peraçoli JC (2007). Measuring the energy spent by parturient women in fasting and in ingesting caloric replacement (Honey). Revista Latino-Americana de Enfermagem, 15: 612-617. DOI: https://www.doi.org/10.1590/s0104-11692007000400014

Nam HN (2019a). Effect of postparturient vaginal discharge on weaning to service interval, pregrancy rate and birth litter size in pigs. Journal of Animal Husbandry and Technology, 247: 71-75.

Nam HN (2019b). Effects of vaginal discharge in sows on diarrhea in sucking piglets. Journal of Animal Husbandry and Technology, 45: 51-55.

Nam HN (2020). Risk factors for prolonged postparturient vaginal discharge in sows. Thai Journal of Veterinary Medicine, 50(1): 57-63. Available at: https://he01.tci-thaijo.org/index.php/tjvm/article/view/243257

Nam HN, and Sukon P (2020). Associated factors for farrowing duration in sows with nutural farrowing in intensive conditions. World's Veterinary Journal, 10: 320-324. DOI: https://www.doi.org/10.36380/SCIL.2020.WVJ41

Oliveira RA, Neves JS, Castro DS, Lopes SO, Santos SL, Silva SVC, Araújo VO, Vieira MFA, Muro BBD, Leal DF et al. (2020). Supplying sows energy on the expected day of farrowing improves farrowing kinetics and newborn piglet performance in the first 24 h after birth. Animal, 14: 2271-2276. DOI: https://www.doi.org/10.1017/S1751731120001317

To cite this paper: Nam NH, Anh Dao BT, and Sukon P (2022). Prediction of Postpartum Vaginal Discharge Duration in Sows. *World Vet. J.*, 11 (2): 60-65. DOI: https://dx.doi.org/10.54203/scil.2022.wvj8

Raheem KA (2017). An insight into maternal recognition of pregnancy in mammalian species. Journal of the Saudi Society of Agricultural Sciences, 16: 1-6. DOI: https://www.doi.org/10.1016/j.jssas.2015.01.002

Rydhmer L, Lundeheim N, and Canario L (2008). Genetic correlations between gestation length, piglet survival and early growth. Livestock Science, 115: 287-293. DOI: https://www.doi.org/10.1016/j.livsci.2007.08.014

Sasaki Y, and Koketsu Y (2007). Variability and repeatability in gestation length related to litter performance in female pigs on commercial farms. Theriogenology, 68: 123-127. DOI: https://www.doi.org/10.1016/j.theriogenology.2007.04.021

Setyawan EMN, Adi YK, Priyo TW, Prihatno SA, Gustari S, Kusumawati A, and Budiyanto A (2021). Placenta expulsion time on different age and breed cows. BIO Web of Conferences, 33: 04007. DOI: https://www.doi.org/10.1051/bioconf/20213304007

Sheldon IM, Cronin J, Goetze L, Donofrio G, and Schuberth HJ (2009). Defining postpartum uterine disease and the mechanisms of infection and immunity in the female reproductive tract in cattle1. Biology of Reproduction, 81: 1025-1032. DOI: https://www.doi.org/10.1095/biolreprod.109.077370

Taverne MA, and van der Weijden GC (2008). Parturition in domestic animals: Targets for future research. Reproduction in Domestic Animals, 43(5): 36-42. DOI: https://www.doi.org/10.1111/j.1439-0531.2008.01219.x

Tummaruk P, and Sang-Gassanee K (2013). Effect of farrowing duration, parity number and the type of anti-inflammatory drug on postparturient disorders in sows: A clinical study. Tropical Animal Health Production, 45: 1071-1077. DOI: https://www.doi.org/10.1007/s11250-012-0315-x

van Dijk AJ, van Rens BT, van der Lende T, and Taverne MA (2005). Factors affecting duration of the expulsive stage of parturition and piglet birth intervals in sows with uncomplicated, spontaneous farrowings. Theriogenology, 64: 1573-1590. DOI: https://www.doi.org/10.1016/j.theriogenology.2005.03.017

Waller C, Bilkei G, and Cameron R (2002). Effect of periparturient diseases accompanied by excessive vulval discharge and weaning to mating interval on sow reproductive performance. Australian Veterinary Journal, 80(9): 545-549. DOI: https://www.doi.org/10.1111/j.1751-0813.2002.tb11033.x

Yang Y, Hu CJ, Zhao X, Xiao K, Deng M, Zhang L, Qiu X, Deng J, Yin Y, and Tan C (2019). Dietary energy sources during late gestation and lactation of sows: effects on performance, glucolipid metabolism, oxidative status of sows, and their offspring1. Journal of Animal Science, 97(11): 4608-4618. DOI: https://www.doi.org/10.1017/s1751731120001317

To cite this paper: Nam NH, Anh Dao BT, and Sukon P (2022). Prediction of Postpartum Vaginal Discharge Duration in Sows. *World Vet. J.*, 11 (2): 60-65. DOI: https://dx.doi.org/10.54203/scil.2022.wvj8