p-ISSN 1410-5659 e-ISSN 2621-5144
Published by:
Unpad Press

Jurnal Ilmu Ternak Universitas Padjadjaran, Juni 2024, 24(1):87-92
DOI: 10.24198/jit.v24i1.52477
Available online at http://jurnal.unpad.ac.id/jurnalilmuternak

DESCRIPTION OF SERVICES PER CONCEPTION, CONCEPTION RATE, AND PREGNANCY RATE IN DAIRY CATTLE POST FOOT AND MOUTH DISEASE AT KPSBU LEMBANG

Maulyda Ahmad Miftahuljannah[1, a], Septiyani[1], Nurcholidah Solihati[2]
[1]*Faculty of Medicine, Padjadjaran University, Sumedang, West Java*
[2]*Faculty of Animal Husbandry, Padjadjaran University, Sumedang, West Java*
[a]*email:* maulyda19001@mail.unpad.ac.id

Abstract
The lack of domestic dairy cow milk availability is partly caused by the decline in the dairy cow population due to FMD (Foot and Mouth Disease). Not only does it cause economic losses, FMD also results in a decline in the reproductive status of dairy cows. The level of productivity can be known quantitatively through the calculation of several reproductive efficiency parameters, namely Service per Conception (S/C), Conception Rate (CR) and Pregnancy Rate (PR). The aim of this research is to describe the reproductive efficiency of post-FMD dairy cattle based on S/C, CR and PR values using a descriptive approach to data from 1,046 sample animals taken from the KPSBU Lembang recording system, which was then tabulated using the Excel program. Based on the calculation results, an overview of the S/C value is obtained, namely 1.635 times, where this value is in the normal category. Meanwhile, for the CR and PR parameters, the values obtained were 49% and 61%, which shows that these values are in the bad category. The results of the analysis can be concluded that FMD reduces reproductive efficiency, namely on the CR and PR parameters, while the S/C parameters show no influence.
Keywords: dairy cattle, foot and mouth disease, service per conception, conception rate, pregnancy rate

GAMBARAN SERVICE PER CONCEPTION, CONCEPTION RATE DAN PREGNANCY RATE PADA SAPI PERAH PASCA PENYAKIT MULUT DAN KUKU DI KPSBU LEMBANG

Abstrak
Kurangnya ketersediaan susu sapi perah dalam negeri salah satunya diakibatkan oleh penurunan populasi sapi perah akibat PMK (Penyakit Mulut dan Kuku). Tidak hanya menyebabkan kerugian secara ekonomi, PMK juga mengakibatkan penurunan status reproduksi sapi perah. Tingkat produktivitas dapat diketahui secara kuantitatif melalui perhitungan dari beberapa parameter efisiensi reproduksi yaitu Service per Conception (S/C), Conception Rate (CR) dan Pregnancy Rate (PR). Tujuan dari penelitian ini adalah mendeksripsikan gambaran efisiensi reproduksi sapi perah pasca PMK berdasarkan nilai S/C, CR dan PR menggunakan pendekatan deskriptif data dari 1,046 hewan sampel yang diambil dari sistem recording KPSBU Lembang, yang kemudian ditabulasi menggunakan program excel. Berdasarkan hasil perhitungan, didapatkan gambaran nilai S/C yaitu 1,635 kali dimana nilai tersebut berada pada kategori normal. Sedangkan pada parameter CR dan PR, nilai yang didapatkan yaitu 49% dan 61%, yang menunjukkan nilai tersebut berada dalam kategori yang buruk. Hasil analisis dapat disimpulkan bahwa PMK memiliki pengaruh terhadap penurunan efisiensi reproduksi yaitu pada parameter CR dan PR, sedangkan pada parameter S/C tidak menunjukkan adanya pengaruh.
Keywords: sapi perah, penyakit mulut dan kuku, service per conception, conception rate, pregnancy rate.

INTRODUCTION

The availability of dairy cow's milk in Indonesia needs to be a concern as an effort to fulfill the nutritional needs of the community. In 2020, the *Badan Pusat Statistik* (BPS) stated that the average amount of milk consumption in Indonesia was 16.27 kg/capita/year. This figure is still much lower than neighboring countries such as Malaysia 26.20 kg/capita/year, Myanmar 26.7 kg/capita/year, and Thailand 22.2 kg/capita/year. In 2022 it will be reported that *Susu Segar Dalam Negeri* (SSDN) has not been able to meet total domestic demand, which can only meet 23% of SSDN needs of 4.4 million tons or around 1 million tons. The remaining 77% still rely on imported milk obtained from various countries (Directorate

General of Animal Husbandry and Animal Health, 2022).

The low production of SSDN is caused by the low population of dairy cattle in Indonesia. According to BPS, SSDN production during 2022 is reported to be 968,980 tons produced from around 592,897 dairy cows. Where the productivity of milk produced by dairy cows is influenced by the health status of the livestock (Yuniarti, 2017). The low health status of livestock due to infectious diseases is one of the factors that can reduce fresh milk production in Indonesia (Jensen *et al.*, 2019).

One of the infectious diseases caused by viruses in Indonesia is Foot-and-Mouth Disease (FMD). It is recorded that FMD was first discovered in Indonesia in 1887 in the Malang area, then by the OIE (Office International des Epizooties) in 1990 Indonesia was declared a FMD-free country without vaccination. After being free from FMD for 32 years, FMD returned to Indonesia in early April 2022, and was then designated as an infectious disease outbreak in livestock in Indonesia by the Indonesian Government through the *Badan Nasional Penanggulangan Bencana* (BNPB) from 29 June to 31 December 2022.

FMD is an infectious disease caused by the *Aphthovirus* in animals with even/ even hooves such as cows, buffalo, sheep, goats, camels and wild animals such as elephants, bison and giraffes (Jamal & Belsham, 2013; World Organization of Animal Health, 2021). The dairy cattle sector is one of the sectors that suffers the most losses from FMD due to the low selling value of dairy cows affected by FMD, high handling costs accompanied by a decrease in daily milk production, as well as a decrease in fertility and high abortions, even death (Naipospos & Suseno, 2017) . Economic losses due to FMD per year for Indonesia are estimated at IDR 15 trillion, with eradication costs that can reach tens of trillions of rupiah (Sudrajat, 2015).

One of the areas experiencing losses due to FMD in West Java is the Koperasi Peternak Sapi Bandung Utara (KPSBU) Lembang, where according to GKSI *(Gabungan Koperasi Susu Indonesia)* the decline in dairy cow milk production due to FMD reached 85% per day. KPSBU Lembang itself is one of the milk cooperatives that dominates West Java and is the largest in Indonesia with a total of 32.25%. As of February 2023, FMD cases have spread to 27 provinces in Indonesia covering 316 districts and cities with a cumulative total of cases of 73,302 dairy cows. West Java Province is included in the top five provinces with the most FMD cases as of February 2023 with a total of 42,220 dairy cows (Ministry of Agriculture of the Republic of Indonesia, 2023). According to GKSI, the decline in livestock population due to FMD at KPSBU Lembang will reach 1,739 head in 2022.

Apart from causing a decline in production aspects, impaired animal health due to FMD can also result in a decline in the reproductive status of dairy cows. Poor reproductive performance of dairy cattle causes a decrease in reproductive efficiency in the livestock system because more input is required per unit than output. The impact of FMD on reproductive performance is categorized as an invisible loss because it is difficult to measure, especially if FMD has become an endemic epidemic (Jones *et al.*, 2016).

In dairy cattle infected with FMD, the virus causes primary infection in the nasopharynx, which then replicates and spreads, causing viremia. Viremia results in widespread distribution of FMD virus to various tissues and organs resulting in systemic infection. The occurrence of systemic infections and the presence of clinical symptoms in animals can cause stressful conditions which result in increased cortisol levels and causes a suppression of the frequency of LH production during the follicular phase of the estrous cycle. In fact, in the process of ovulation, LH is very necessary for the final growth of the follicle and ovulation.

The effects of FMD infection can also reduce ovarian function, especially in the folliculogenesis process (Satsook *et al.*, 2020). FMD is known to have long-term effects, indirectly affecting the productivity of dairy cows because it can affect ovarian function due to disruption of the folliculogenesis process which ultimately disrupts the ovulation process.

To assess whether cow productivity is good or not, it can be determined quantitatively through calculations of reproductive efficiency parameters. Reproductive efficiency is a measure of a cow's ability to become pregnant and produce viable offspring, which can be assessed through several parameters including Service per Conception (S/C) to calculate the number of Artificial Inseminations (AI) until pregnancy occurs, Conception Rate (CR) for

calculate the percentage of cows that become pregnant in the first AI, and Pregnancy Rate (PR) to calculate the percentage of pregnancy from the total cows that undergo AI.

Researchers obtained information that there has not been much research discussing the impact of FMD on reproductive efficiency and there is still limited data regarding the relationship between FMD and reproductive performance at KPSBU Lembang. Thus, the researchers are interested in conducting research regarding the description of S/C, CR, and PR in dairy cows after FMD infection at KPSBU Lembang. It is hoped that the results of the research can become a reference for better dairy cattle management practices, especially for dairy cattle infected with FMD, so that reproductive efficiency can be increased and the losses incurred can be minimized.

MATERIALS AND METHODS

This research is descriptive quantitative research. The stages of this research include determining sample animals based on data in the recording system, grouping data, and carrying out data collection to obtain the required variables. The dairy cattle recording data obtained was then recorded for each factor studied, and processed by entering it into each formula to calculate S/C, CR, and PR.

Sampling in this research used census techniques, also known as saturated samples. Saturated sampling is a sampling technique when the entire population is used as a sample and is known as a census (Sugiyono, 2014). The inclusion criteria in this study were Cows post FMD infection and those that had never been exposed to FMD for comparison, Cows that were artificially inseminated in October 2022, Cows that will undergo pregnancy checks in January 2023, Cows with at least 1 parturition, and Cows recorded in the KPSBU Lembang recording system. In cows that had recovered from FMD, the number of samples used was 260 heads. In cows that were not affected by FMD, the number of samples used was 786 heads.

This research has been approved by the Ethics Committee of Padjadjaran University. The use of research data in the form of medical records to be published must be accompanied by the researcher's commitment regarding the principles of medical records, namely maintaining privacy, confidentiality, and not misusing the data outside of research interests (Gunawan & Christanto, 2020).

RESULTS AND DISCUSSION

Below is a table of the results of calculating reproductive efficiency in post-FMD dairy cows in the Lembang KPSBU working area.

Normal S/C values range from 1.6 to 2.0 (Afiati *et al.*, 2013). The S/C values for post-FMD dairy cows and dairy cows not affected by FMD at KPSBU Lembang are both in the normal range. However, there was an increase in the S/C value of 0.018% in cows that had been infected with FMD. This can indicate that in cows that have been infected with FMD, the cow's fertility level decreases. The lower the S/C value, the higher the cow's fertility value. On the other hand, the higher the S/C value, the lower the cow's fertility value and the occurrence of repeated mating.

The CR value obtained in dairy cows after FMD was higher compared to dairy cows that were not affected by FMD. Fanani *et al.* (2013) stated that a good CR value is in the range of 60-70%. In dairy cows that had been infected with FMD and those that had not been infected with FMD, both had poor CR values, namely 49% and 45%, which means that 49% and 45% of AI acceptors succeeded in getting pregnant in the first AI treatment.

PR values for post-FMD dairy cows and dairy cows not affected by FMD are not much different, namely 61% and 62%. This means that of all females subjected to AI, 61% and 62% of females successfully became pregnant. The PR value of cows that were not affected by FMD was 1% higher than cows that were post-FMD. The PR value is said to be good if it is more than 65% (Hardjopranjoto, 1995), so it can be said that all the animals sampled have a bad PR value. The PR value in dairy cattle is influenced by the condition of the female cow's reproductive health, age, parity (Yulyanto *et al.*, 2014), straw quality and rearing management. Apart from that, the PR value is also influenced by the skills of the inseminator officer in carrying out IB and environmental temperature (San *et al.*, 2015).

There is not much data that provides information regarding the direct impact of FMD on the reproductive efficiency of dairy

cows, especially regarding S/C, CR, and PR. In research conducted by Chaters *et al.* (2018), FMD in endemic areas has an impact on the fertility performance of dairy cows. Increasing age at first calving may reduce an animal's lifetime productivity, while poor conception rates are likely to lengthen calving intervals. This may be due to reduced feed intake and growth rate associated with clinical disease although inflammatory disease can cause endocrinopathies resulting in poor quality of the dominant follicle, corpus luteum, and failure of conception. FMD can cause an increase in the incidence of anestrus caused by inactive ovaries, thus causing fertility problems in dairy cattle.

According to Nath *et al*. (2015), cows infected with FMD have regressed ovaries, a lack of graafian follicles or corpus luteum, and decreased progesterone levels in the luteal phase. One of the reasons for this decrease in progesterone levels is a lack of food intake due to lesions in the oral cavity. Reduced feed intake has an impact on the high incidence of ovarian inactivation, low estrous behavior, and the incidence of ovulation.

The value obtained based on the calculation results shows a bad CR value. In Chaters *et al.'s* (2018) research in Kenya regarding the effects of FMD on fertility, dairy cows were grouped into the category of being vulnerable to stress in fertility, because FMD is known to affect the animal's time to conception when the virus attacks in the pre-antral and antral periods during follicle development. In addition, the value of the risk level or the hazard ratio shows that differences in the parity are associated with delayed conception.

Research conducted by Satsook *et al.* (2020) explained the effects of FMD infection on goat ovarian function, especially on the folliculogenesis process. Goats infected with FMD with clinical symptoms had a lower number of follicles in the ovulatory follicle wave than those without clinical signs.

Cows infected with FMD have higher levels of oxidative stress compared to uninfected cattle (Soltani *et al.,* 2020). Khoshvaghti *et al.* (2014) reported low serum SOD (Superoxide dismutase) and GPx (Glutathione peroxidase) activities without changes in CAT in cattle infected with the FMD virus. SOD, CAT, and GPx are the first-line defense antioxidant enzymes. This enzyme converts superoxide radicals, breaking down hydrogen peroxide and hydroperoxide into harmless molecules.

In dairy cattle infected with FMD, the process of producing oxidative stress resulting from reactive oxygen occurs faster than the protective process carried out by antioxidants. This has negative effects on animal health and productivity and is a major initiator of tissue damage (Bernabucchi *et al.,* 2002; Patil *et al.,* 2002).

Table 1. Results of Pregnancy Checks for January 2023

Examined Dairy Cows	Number of Dairy Cows	
	Post-FMD	**Non-FMD**
Pregnant	160	489
Not Pregnant	100	297
Total	260	786

Table 2. Research Parameter Calculation Results

Variable	Dairy Cows	
	Post-FMD	**Non-FMD**
S/C	1.625 times	1.607 times
CR	49%	45%
PR	61%	62%

Systemic infection and the presence of clinical symptoms in animals infected with FMD can cause stressful conditions resulting in increased cortisol levels (Saravanan, 2020). An increase in cortisol levels occurs when there is a stressor in the body, then the brain will receive the stressor as a response that affects the hypothalamus. During the follicular phase of the estrous cycle, the frequency of LH (luteinizing hormone) production will be suppressed by the presence of high cortisol. Without LH, even though FSH (Follicle Stimulating Hormone) is available in large quantities, the follicles will not develop to the ovulation stage. Low LH values cause AI not to be timely so that fertilization does not occur and ultimately fails to become pregnant.

The low CR value obtained from this research can also be caused by the CR value being largely determined by the fertility of the bull, the fertility of the acceptor, and the insemination technique (Salim *et al.*, 2018). This factor is not only seen from the acceptor's performance but several other factors should also be considered, such as the animal's stress level, reproductive status, and genetic quality. Insufficient knowledge from breeders regarding feed nutrition and the environment can also sometimes be one of the causes. Low nutrition in feed can result in repeated mating and premature embryo death.

Through this research, the reproductive efficiency of livestock can be determined as good or bad. This insight can be beneficial for veterinarians and medical personnel in understanding the needs and challenges faced by farmers, such as livestock rearing techniques, management of infectious and non-communicable diseases, effective reproductive management, hygiene and sanitation management, health monitoring, and preventive care. This research can also increase insight for farmers regarding better dairy cow management practices, for example: selecting quality dairy cow breeds, providing good nutrition, early identification and treatment of health problems, maintaining a healthy environment, preparing an appropriate breeding schedule, and good management of lactating cows.

CONCLUSIONS

Based on the calculation results of the reproductive S/C, CR, and PR parameters in post-FMD dairy cows at KPSBU Lembang, an overview of the S/C value was obtained, namely 1.635 times, which is in the normal category. Meanwhile, the CR and PR values in post-FMD dairy cows were 49% and 61% respectively, which are in the poor category. It is concluded that FMD reduces the cow's conception rate and pregnancy rate, but not the S/C.

REFERENCES

Afiati, F. Herdis., & S. Said. (2013). *Pembibitan Ternak dengan Inseminasi Buatan*. Penebar Swadaya. Jakarta. Hal. 73.

Chaters, G., Rushton, J., Dulu, T.D., & Lyons, N.A. (2018). Impact of Foot and Mouth Disease on Fertility Performance in a Large Dairy Herd in Kenya. *Prev Vet Med.* 1(159): 57-64.

Chaters, G., J. Rushton., T.D. Dulu., & N.A. Lyons. (2018). Impact of foot-and-mouth disease on fertility performance in a large dairy herd in Kenya. *Prev Vet Med*, 18:57–64.

Direktorat Jenderal Peternakan dan Kesehatan Hewan, Kementerian Pertanian Republik Indonesia. 2022. *Sejarah Indonesia Bebas Penyakit Mulut dan Kuku (PMK)*. Diakses melalui: https://ditjenpkh.pertanian.go.id/berita/1473-sejarah-indonesia-bebas-penyakit-mulut-dan-kuku-pmk

Fanani, S., Y.B.P. Subagyo., & Lutojo. (2013). Kinerja Reproduksi Sapi Peranakan Friesian Holstein (PFH) di Kecamatan Pudak, Kabupaten Ponorogo. *Jurnal Tropical Animal Husbandry*, 2 (1): 21-27.

Gunawan, S., & G. Christianto. (2020). Rekam Medis atau Kesehatan Elektronik (RMKE): Integrasi Sistem Kesehatan. *J Etik Ked Ind*. Vol. 4(27): 43.

Hardjopranjoto. (1995). *Ilmu Kemajiran pada Ternak*. Airlangga University Press, Surabaya. Hal. 198-201.

Jamal, S.M., & G.J. Belsham. (2013). Foot and Mouth Disease: Past, Present and Future. *Vet Res*. Vol. 44(1): 1–14.

Jensen, K.C., C. Frömke., B. Schneider., P.D. Duc., G. Frieder., B. Katrin., S. Franziska., S. Theresa., K. Anika., W. Svenja., S. Christian., H. Martina., & C. Amely. (2019). Case Control Study on Factors Associated with a Decreased Milk Yield anda Depressed Health Status of Dairy Herds in Northern Germany. *BMC Vet Res*. Vol. 5(15): 1-11.

Jones, K.T.J., M. McLaws., & J. Rushton. (2016). Foot and Mouth Disease Impact on Smallholders – What Do We Know, What Don't We Know and How Can We Find Out More?. *Transboundary and Emerging Diseases.* Vol. 64(4): 1079-1094.

Kementerian Pertanian Republik Indonesia. (2023). *Sebaran Kasus PMK. Siaga PMK*. Diakses melalui: https://www.siagapmk.id/

Khoshvaghti, A., Askari, A., Nazifi, S. (2014). Evaluation of some Antioxidant Enzymes in Cattle Infected with Foot and Mouth Virus. İstanbul Üniversitesi Veteriner Fakültesi Dergisi. 40:70-75.

Naipospos, T.S.P., & P.P. Suseno. (2017). Cost Benefit Analysis of Maintaining FMD Freedom Status in Indonesia. *Report to the World Organisation of Animal Health.* Jakarta. Hal 14-16.

Nath, R., Prasad, R.L., Deka, S.S., Adil, A., Senapatti, M., Muzaharul. 2015. Impact of Foot and Mouth Disease on Ovarian Activity in Cows. *Sch J Agric Vet Sci.* 2(3A): 166-168.

Sugiyono. (2014). Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D. Bandung: Alfabeta.

Salim, A., Yekti, A,P.A., Kuswati., & Susilawati, T. (2018). Perbedaan Keberhasilan Inseminasi Buatan Menggunakan Semen Beku dan Semen Cair Menggunakan Pengencer Cep-3 + Kuning Telur Pada Sapi Persilangan Ongole. *Jurnal Ternak Tropika*. 19(1):66-72.

San, D.B.A., I.K.G.Y. Mas., & E.T. Setiatin. (2015). Evaluasi Keberhasilan Inseminasi Buatan pada Sapi Simmental – PO (SIMPO) di Kecamatan Patean dan Plantungan Kabupaten Kendal, Jawa Tengah. *Anim Agric J*. 4(1): 171-176.

Saravanan, S., Umapathi, V., Priyanka, M., Hosamani, H., Sreenivasa, B.P., Patel, B.H.M., Narayanan, K., Sanyal, A., Basagoudanavar S.H. (2020). Hematological and Serum Biochemical Profile in Cattle Experimentally Infected with Foot-and-Mouth Disease Virus. *Vet World.* 13(3): 426-432.

Satsook, P., S. Rattanatabtimtong., L. Piasai., P. Towiboon., C. Somgird., & A. Pinyopummin. (2020). Ovarian Activity in Croossbreed Thai Native Does During Naturally Occuring Foot-and-Mouth Disease (FMD) Virus Infection. *Tropical Animal Health and Production.* Vol 53(269): 1-6.

Soltani, H., Aslani, M.R., Mohebbi, A., & Mokhtari, A. (2020). Serum Biochemical and Oxidative Status in Holstein Cattle Affected with Foot and Mouth Disease. *Iranian Journal of Veterinary Science ad Technology.* 19-24.

Sudrajat, S. (2015). *Kerugian Triliunan Rupiah Mengancam*. Diakses melalui: https://agroindonesia.co.id/kerugian-triliunan-rupiah-mengancam/

World Organisation of Animal Health. (2021). *OIE Terrestrial Manual*. OIE, Paris. Hal. 1-34.

Yulyanto, C.A., T. Susilowati., & M.N. Ihsan. (2014). Penampilan Reproduksi Sapi Peranakan Ongole (PO) dan Sapi Peranakan Limousin di Kecamatan Sawoo Kabupaten Ponorogo dan Kecamatan Tugu Kabupaten Trenggalek. *J Ilmu-Ilmu Peternakan*. 24(2): 49-57.

Yuniarti, Y.S. (2017). *Hubungan BCS dengan Produksi Susu pada Berbagai Bulan Laktasi Sapi Perah PFH*. Repository BKG (Brawijaya Knowledge Garden). Fakultas Peternakan, Malang.