

## Effect of lameness in early lactation on selected reproductive parameters of dairy cows

### Vliv kulhání na vybrané reprodukční ukazatele dojeného skotu v rané fázi laktace

Jan VOBR<sup>1</sup> (✉), Veronika ČOUDKOVÁ<sup>1</sup>, Anna BAŠTÝŘOVÁ BRUTOVSKÁ<sup>1</sup>, Jan BERAN<sup>1</sup>,  
Miroslav MARŠÁLEK<sup>1</sup>, Pavel KVAPIL<sup>2</sup>, Dana KUMPRECHTOVÁ<sup>3</sup>

<sup>1</sup> Faculty of Agriculture, University of South Bohemia in České Budějovice, Studentská 1668, 370 05, České Budějovice, Czech Republic

<sup>2</sup> Ljubljana Zoo, Veterinary Department, Večna pot 70, 1000 Ljubljana, Slovenia

<sup>3</sup> Institute of Animal Science Prague, Přátelství 815, 104 00 Prague, Czech Republic

✉ Corresponding author: [janvobr@seznam.cz](mailto:janvobr@seznam.cz)

Received: June 7, 2024; accepted: November 8, 2024

#### ABSTRACT

Lameness of dairy cows is one of the diseases that significantly impact their health, welfare, production and reproduction parameters. Data were collected from 310 Czech Fleckvieh (Simmental) pregnant dairy cows in 2017 and 2018. The study aimed to determine the effect of lameness occurrence in the post-calving period until the insemination resulting in pregnancy, on selected reproductive parameters of the dairy cows: calving to conception interval (CCI) and number of services per conception (NSC). The following lameness criteria were used: incidence of lameness, cause of lameness (infectious, non-infectious, combined), number of affected limbs (one or multiple), number of lameness episodes (one or multiple). The CCI was significantly longer ( $P < 0.001$ ) in lame animals (by 17 days), with the difference increasing to 28.25 days in the case of multiple affected limbs, and to 29.54 days in animals with multiple lameness episodes. A significant influence of infectious and combined diseases on the length of the CCI was confirmed, extending it by 21.82 and 24.9 days, respectively. NSC in lame animals (2.13) tended to differ from healthy cows (1.89) with a significant increase to 2.47 in cows with multiple lameness episodes ( $P < 0.05$ ). This indicates that lameness in the post-calving period is an important aspect negatively influencing the monitored reproductive parameters of cows. The conclusion of the study shows that lameness in dairy cattle herds has a significant economic impact.

**Keywords:** cattle, calving to conception interval, number of services per conception, claw disease

#### ABSTRAKT

Kulhání krav patří mezi onemocnění, která mají významný vliv na jejich zdraví, welfare, produkční a reprodukční ukazatele. Data byla získána od 310 kusů březích dojníc plemene českého strakatého skotu za rok 2017 a 2018. Cílem studie bylo určit vliv výskytu kulhání v období od otelení do inseminace, na kterou kráva zabřezla, na vybrané reprodukční parametry dojnice - servis periodu a inseminační index. Za hodnotící kritéria kulhání byly zvoleny výskyt kulhání, příčina kulhání (infekční, neinfekční a kombinovaná forma), množství postižených končetin (jedna nebo více končetin), opakování výskytu kulhání (jednorázové, opakované). Signifikantně delší ( $P < 0.001$ ) hodnota servis periody byla v případě kulhajících zvířat (o 17 dní), pokud bylo postiženo více končetin tak se rozdíl navýšil na 28.25 dní, u krav s opakovaným kulháním na 29.54 dní. Byl také potvrzen signifikantní vliv infekčních a kombinovaných onemocnění na délku servis periody (prodloužení o 21.82 a 24.9 dní resp.). Inseminační index u kulhajících zvířat (2.13) měl tendenci se lišit od zdravých jedinců (1.89). Průkazné navýšení na 2.47 bylo sledováno u opakovaně kulhavých krav ( $P < 0.05$ ). Ukázalo se, že kulhání v období po otelení je důležitým aspektem negativně ovlivňujícím sledované reprodukční parametry. Ze závěru práce vyplývá, že problematika kulhání ve stádě dojeného skotu má značný ekonomický dopad.

**Klíčová slova:** kráva, servis perioda, inseminační index, onemocnění paznehtů

## INTRODUCTION

Dairy cattle farming has been facing major challenges in recent years. Milk prices have been alternately hovering at and below the break-even point for profitability. The situation forces farmers to think carefully about investments and review costs. Lameness and fertility disorders have long been the key issues that are closely linked. Lameness belongs to the disorders that have a significant effect on the health, welfare and production of dairy cows (Huxley, 2013). Globally, lameness is still a major problem, with prevalence reaching almost 26% across studies done in Austria, Canada, China, Finland, Germany, Italy, the Netherlands, New Zealand, Norway, the United Kingdom and the United States of America (Cook, 2003; Amory et al., 2006; Dippel et al., 2009; Kielland et al., 2009; Barker et al., 2010; Von Keyserlingk et al., 2012; Sarjokari et al., 2013; Chapinal et al., 2014; Fabian et al., 2014; Popescu et al., 2014; Cook et al., 2016). A lower incidence of lameness (16.5% and 8.3%, respectively) has been observed in year-round grazing systems or even on farms where cows are grazed for only part of the year (Amory et al., 2006; Fabian et al., 2014). On the other hand, there is a high incidence of lameness (31-54%) in conventional loose housing systems with hard concrete floors (Chapinal et al., 2013; Von Keyserlingk et al., 2013). Lameness in heifers increases the risk of lameness in future lactations (Hirst et al., 2002; Green et al., 2014; Randall et al., 2015), and thus becomes an important limiting factor that has an impact on their lifelong production. In dairy cows, lameness has also been shown to have a significant impact on performance, in particular by reducing milk production and increasing the culling of affected animals (Booth et al., 2004; Amory et al., 2008). Some studies have described the effect of lameness on reproductive performance, such as the association of lameness with delayed ovarian activity postpartum. Ovarian activity was reduced by 71% in lame cows. In another study, it was reported that the calving to conception interval was extended by 36-50 days in lame cows (Garbarino et al., 2004). Bicalho et al. (2007) observed that lameness within 70 days of calving reduces the conception rate and increases the culling and

death rate in dairy cows. Lameness is associated with a prolonged calving to the first service interval, and thus a longer calving to the conception interval. The greatest increase in these intervals, 17 and 30 days, respectively, was observed in dairy cows suffering from white line diseases or sole ulcer between 36 and 70 days postpartum (Lucey et al., 1986). In herds with seasonal breeding and almost all year-round grazing, reproductive performance was significantly worse in cows that became lame during the breeding season or had been lame before, compared to cows that were not lame. Due to poor fertility results, such cows were more likely not to be bred anymore (Somers et al., 2015). Dairy cows that did not have a history of lameness conceived faster than lame cows (Hernandez et al., 2005). This study also confirms that the cows which had low lameness scores post-calving (or from calving to first service) conceived earlier than those with high lameness scores. Locomotion scoring is a tool to address the first issue (i.e., determine the extent of lameness). A locomotion score is a qualitative index of a cows ability to walk normally. Visually scored on a scale of 1 to 5, where a score of 1 reflects a cow that walks normally and a score of 5 reflects a cow that is three-legged lame, a locomotion score is made in a few seconds per cow (Sprecher et al., 1997). Early diagnosis and professional treatment of lameness can alleviate the negative effect on fertility in affected animals. Logroño et al. (2021) found that cows becoming lame after the first service had an 87-day longer calving-to-pregnancy interval than healthy cows and that cows becoming lame before the first service had a 38-day longer calving-to-pregnancy interval than healthy cows. The timing of lameness case occurrence in lactation is associated with its impact on productive and reproductive performances in grazing dairy cows. The occurrence of infectious hoof diseases in heifers and cows during the first lactation significantly affects their subsequent productivity and reproduction. Recurrence of digital dermatitis increases the value of calving to conception interval and reduces pregnancy success in primiparous cows (Gomez et al., 2015).

## MATERIAL AND METHODS

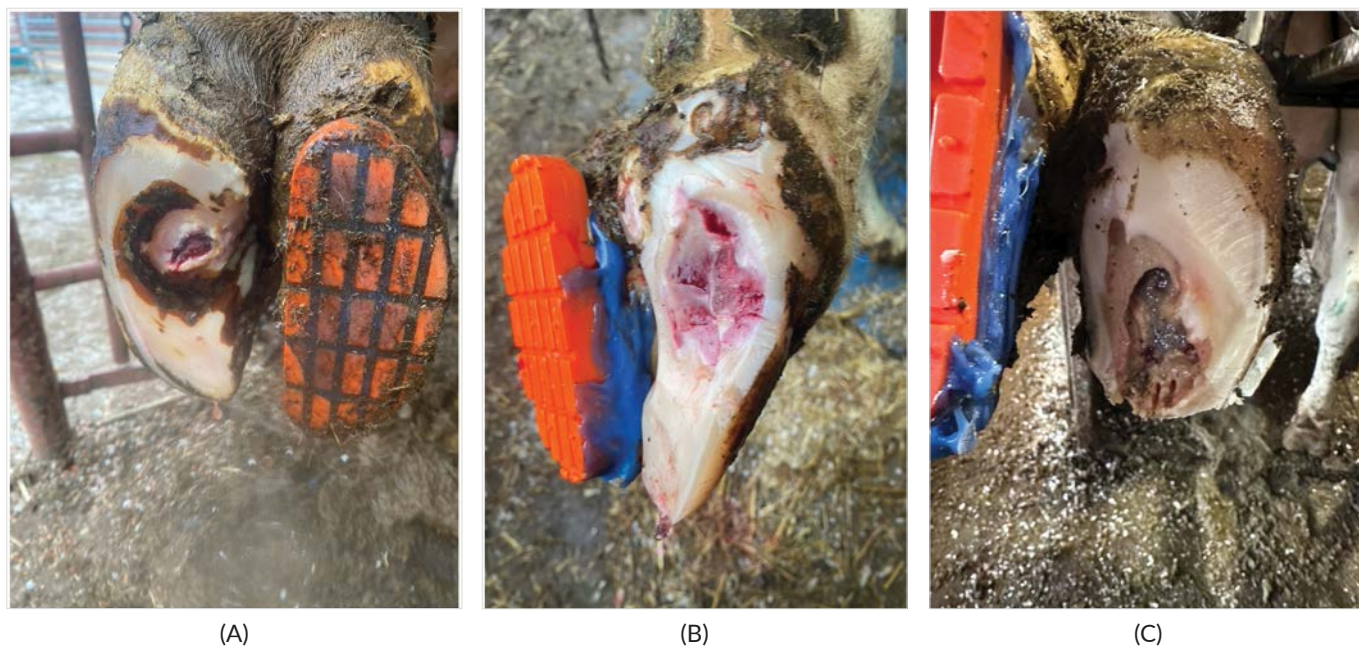
### Data Collection

Monitoring took place between 2017 and 2018 on a commercial farm in the Vysočina region, Czech Republic (49,411314° N, 14,985265° E). The data of selected reproductive parameters were analyzed in the study from the online database of eskot within the Czech Moravian Society of Breeders (ČMSCH, 2023). Approximately 570 dairy cows, mostly Czech Fleckvieh (Simmental) breed are reared there. Only pregnant cows with complete records of all monitored parameters were included in the study. The average milk yield performance was around 8,500 kg per 305-days lactation. The herd mean reproduction values were a calving interval (CI) of 375 days, a calving to conception interval (CCI) of 85 days, and a number of services per conception (NSC) of 2.1. On the farm, the cows are grouped according to milk production and lactation phase. We chose a herd with good infectious disease status to minimize the bias of results which may result from the presence of infectious diseases. The herd was infectious bovine rhinotracheitis, bovine viral diarrhoea and trichophytosis pathogen free. On the farm the cows are housed in a freestall barn with cubicles bedded with manure solids and straw. The floor is made

of longitudinally grooved concrete. The parlour holding pen has a slatted concrete floor. In the milking parlour (side by side, 2 × 16, rapid exit) a 3 cm thick profiled rubber mat has been placed to increase cow comfort. The cows are milked twice a day and right after milking each cow goes back to the respective pen. The hoof care consists of routine functional trimming twice a year and the cows walk through the foot bath every two weeks to prevent infectious hoof diseases. The foot bath solution contains copper sulphate and probiotics. The treatment of lame animals takes place every two weeks, followed by checks of healing at two-to-four-week intervals depending on the severity and type of disease. The following parameters were recorded: date of calving, date of insemination on which the cow became pregnant, and number of services per conception (NSC) including re-inseminations and calving to conception interval (CCI). The incidence of lameness (lame, non-lame) was monitored between the calving and a successful service resulting in conception (confirmed by a pregnancy check). Other parameters were the cause of lameness (infection, non-infection, combined) (Figures 1, 2 and 3), number of affected limbs (one or multiple) and number of lameness episodes (one or multiple).



Figure 1. Infection causes of lameness: A - Interdigital dermatitis, B - Interdigital phlegmon (foot rot), C - Digital dermatitis



**Figure 2.** Non-Infection causes of lameness: A - Sole ulcer, B - White line disease, C- Toe ulcer



**Figure 3.** Combined causes of lameness: A - Interdigital phlegmon combined with sole ulcer, B - Digital dermatitis associated white line abscess, C - Digital dermatitis associated bulb ulcer

### **Data analysis**

The data were processed with Microsoft Office Excel. The program Statistika14 (TIBCO®) was used for the statistical evaluation of the monitored values. Descriptive statistics were used for basic data evaluation: number of observations, average value, minimum, maximum and standard deviation. The influence of the selected factors

was evaluated using a one-factor analysis of the variance of the data with commonly used significance limits (0.05; 0.01; 0.001). Subsequent multiple comparisons were performed using Tukey's HSD test for unequal numbers of N in case there were different numbers of observations in the monitored groups.

## RESULTS AND DISCUSSION

A total of 310 cows (N = 310) were analyzed during the main observation period from calving to successful insemination. The occurrence of hoof disease and lameness was recorded in 151 (47%) dairy cows, and the remaining 159 cows did not develop hoof disease and lameness. Table 1 shows an overview of descriptive statistics for the calving to conception interval (CCI) and services per conception (NSC).

The average value of the calving to conception interval was 86.49 days, with a minimum value of 38 days and a maximum value of 269 days. Burdych and

Kocmánek (2021) state that the ideal value of the calving to conception interval is 85 days, but it could be longer for highly productive animals. In 2020, the average value of the calving to conception interval for Czech Simmental (Fleckvieh) in the Czech Republic was 105 days. It can be seen that animals suffering from lameness had an average calving to conception interval (CCI) value of 17.12 days higher compared to healthy cows. The cows that had only one episode of lameness had a CCI of 92.53 days and the cows with multiple lameness episodes had a CCI of 15.16 days longer (Table 1).

**Table 1.** Summary of descriptive statistics of the criteria evaluated for the reproductive parameters

Variable	Group	N	Mean	Minimum	Maximum	S.D.	Variance
Calving to conception interval	All cows	310	86.49	38	269	42.23	1783.73
	Lame cows (present lactation)	151	95.27	39	219	43.37	1880.84
	Non-lame cows (present lactation)	159	78.15	38	269	39.49	1559.15
	One lameness episode	113	92.53	41	219	41.86	1752.27
	Multiple lameness episodes	32	107.69	39	185	48.05	2309.00
	One affected limb	108	92.31	39	219	42.13	1774.98
	Multiple affected limbs	40	106.40	45	193	45.55	2075.07
	Infectious lameness	62	99.97	39	219	43.39	1882.95
	Non-infectious lameness	47	85.02	41	204	40.39	1631.02
	Combined lameness	38	103.05	40	185	45.86	2103.40
Number of services per conception	All cows	310	2.00	1	7	1.29	1.66
	Lame cows	151	2.13	1	7	1.29	1.66
	Non-lame cows	159	1.89	1	7	1.28	1.65
	One lameness episode	113	2.07	1	7	1.27	1.60
	Multiple lameness episodes	32	2.47	1	6	1.39	1.93
	One affected limb	108	2.11	1	7	1.29	1.67
	Multiple affected limbs	40	2.25	1	6	1.30	1.68
	Infectious lameness	62	2.16	1	6	1.35	1.81
	Non-infectious lameness	47	1.98	1	7	1.31	1.72
	Combined lameness	38	2.29	1	5	1.16	1.35

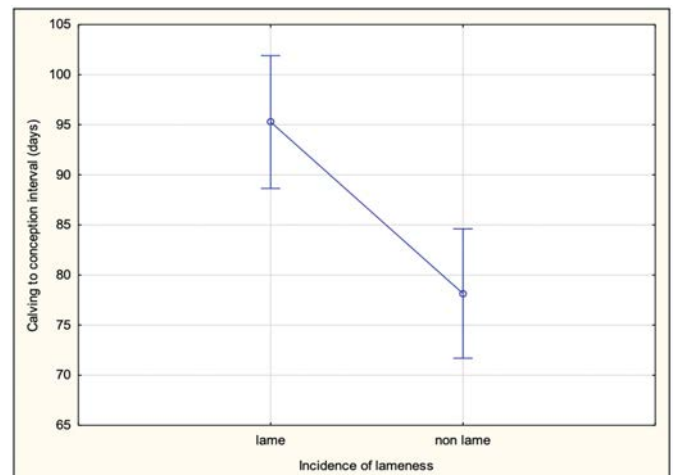
In the case of cows with multiple affected limbs, the length of the CCI reached an average of 106.4 days. From the results of Table 1, it also follows that the longest CCI was for the combined causes of lameness, 103.05 days. The average value of the NSC was 2.00 for the monitored animals, with a minimum value of 1.00 and a maximum value of 7.00. Excellent values of services per conception (NSC) without re-insemination are up to 1.6, good 1.6-1.9, unfavourable 2.0-2.2 and unsatisfactory above 2.2. The optimal values of the NSC with re-inseminations in Czech Simmental (Fleckvieh) in the Czech Republic are <1.9 (Burdych and Kocmánek, 2021). The group of cows affected by lameness had an average NSC value of 0.24 higher compared to healthy animals. For cows with multiple lameness episodes, the value of the NSC was 2.47, and for those with a single incidence, it was 0.40 lower. Cows with multiple affected limbs by lameness reached the value of an NSC of 2.25. The highest NSC values were for the combined causes of lameness 2.29 (Table 1).

#### ***The influence of the evaluated parameters on the level of the calving to conception interval***

For all monitored parameters related to the lameness of dairy cows, a statistically highly significant effect on the value of the CCI was recorded ( $P < 0.01$ ). The results in Table 2 show that the incidence of lameness, the cause of hoof lameness, the number of lameness episodes (one or multiple) and the number of affected limbs (one or multiple) significantly influence the length of the CCI. This result demonstrates the importance of hoof disease and lameness in cows in relation to their reproduction and follows other authors who confirm this fact (Somers et al., 2015).

#### ***Evaluation of the influence of incidence of lameness on the calving to conception interval***

Figure 4 shows the effect of lameness in the monitored period on the value of the CCI. The study demonstrated a high statistical significance of the effect of lameness on the CCI. This finding is also in line with other authors (Lucey et al., 1986; Vacek et al., 2007; Gomez et al., 2015).



**Figure 4.** Graphical results of analysis of variance evaluating the effect of lameness on the calving to conception interval

In lame cows, the average value of the CCI was 95.27 days compared to 78.15 days in healthy animals. The difference between these groups is therefore 17.12 days to the disadvantage of animals affected by lameness and relatively corresponds to the results of Collick et al. (1989), who noted an extension of the calving to conception interval (CCI) in lame cows by 14 days compared to the control group. Even if the value of the CCI is statistically significantly higher for lame animals, it is still a very good condition on average, because the results of the CCI from 81 to 95 days are rated as excellent, above 95 to 110 days as satisfactory (Burdych and Kocmánek, 2021).

#### ***Evaluation of the effect of the number of lameness episodes (one or multiple) on the calving to conception interval***

Monitoring showed (Figure 5) a high statistical significance influence of the repeated lameness on the CCI, one-time or repeated lameness compared to the group of healthy cows ( $P < 0.001$ , Table). The results of the multiple comparisons (Table 3) show that the occurrence of repeated lameness in the monitored period worsens the value of the CCI.

Although there is a noticeable difference in the average values of the CCI between both groups of affected animals (one incidence 92.53 days, multiple incidences 107.69 days), this difference is not statistically significant due to the small number of observations.

**Table 2.** Evaluation of the influence of monitored factors on the value of calving to conception interval

Factors	s.v.	F-test	P	Significance
Occurrence of hoof disease and lameness Yes - No	1	13.34	0.000	***
Number of lameness episodes	2	8.79	0.000	***
Cause of lameness	2	6.57	0.000	***
Number of limbs affected	2	9.48	0.000	***

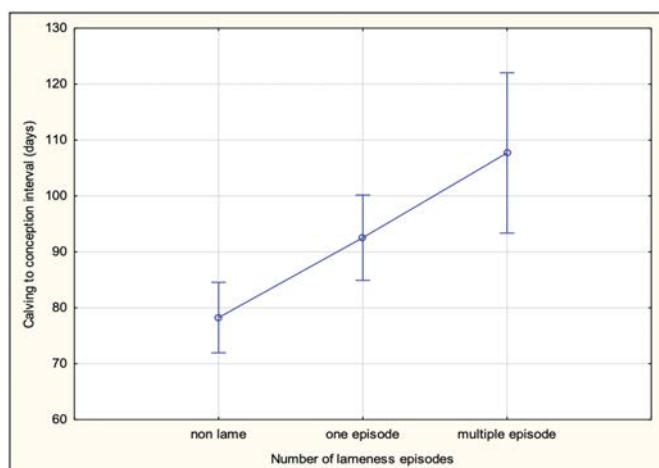
Data are presented as statistical significance  $P < 0.001$ (\*\*\*),  $P < 0.01$ (\*\*),  $P < 0.05$ (\*),  $P > 0.05$ (-)

**Table 3.** Multiple comparisons of calving to conception interval within evaluated groups of cows (non-lame, one lameness episode, multiple lameness episodes)

	Mean CCI	Non lame	One lameness episode	Multiple lameness episodes
Non-lame	78.24		0.025 <sup>a)</sup>	0.012 <sup>a)</sup>
One lameness episode	92.53	0.025 <sup>a)</sup>		0.305
Multiple lameness episodes	107.69	0.012 <sup>a)</sup>	0.305	

Abbreviations: CCI, Calving to conception interval

<sup>a)</sup> Data are presented as statistical significance  $P < 0.05$



**Figure 5.** Graphical results of analysis of variance evaluating the effect of the number of lameness episodes on the calving to conception interval

These results follow the work of Charfeddine and Perez-Cabal (2017), who observed that severe, complicated lameness in cows can have up to three times the economic impact compared to mild lameness. In other studies, an increase in CCI values and a decrease in pregnancy success were observed in primiparous heifers

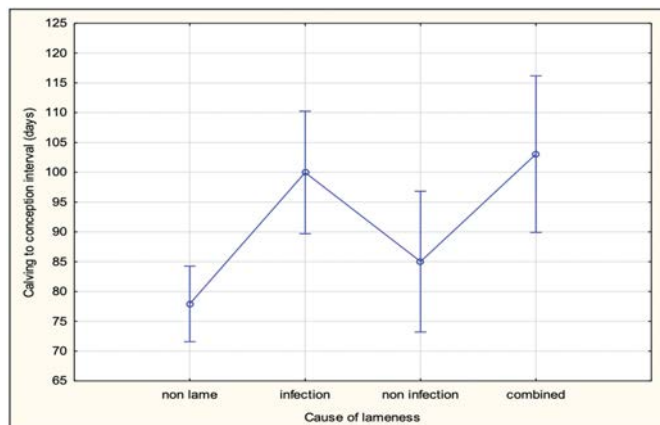
with repeated occurrence of digital dermatitis (Gomez et al., 2015).

However, it is important to note that the average value of the CCI is also satisfactory for affected animals (Burdych and Kocmánek, 2021). From this, we can conclude that the lame cow's management is well set up on the farm, which confirms the observation of the team of Hernandez et. al (2005) that early diagnosis and professional treatment of lameness in dairy cows can reduce the negative effect on reproduction in affected animals.

*Evaluation of the effect of cause disease (infectious diseases, non-infections or combined diseases) of the hoofs on the value of the calving to conception interval*

Figure 6 shows the influence of different causes of diseases on the value of the CCI. The observation shows that combined and infectious causes of diseases had a highly statistically significant effect on the value of the CCI compared to healthy animals ( $P < 0.01$ ). This is in line with the work of Gomez et al. (2015) who described

the significant effect of infectious hoof diseases on the reproductive parameters of cattle. The multiple representation (Table 4) shows a low impact of non-infectious diseases on the CCI value, which was not statistically proven.



**Figure 6.** Graphical results of analysis of variance evaluating the cause of lameness on the calving to conception interval

This is in disagreement with the work of Lucey et al. (1986), who observed in cows suffering from white line or sole hoof diseases between 36 and 70 days after calving, a significant prolongation of the CCI compared to the control group. The worst result of the CCI value was achieved by animals with combined causes of disease, i.e. 103 days. For infectious causes, the CCI value was 99 days. Animals with non-infectious disease had a lower CCI value of 86 days compared to other types of disease. Combined and infectious causes had a statistically highly significant effect on the CCI value compared to

animals with non-infectious disease ( $P < 0.01$ ). Higher CCI values in combined and infectious hoof disease and thus problems with conception may be related to ongoing inflammation (Garvey, 2022). Cows affected by non-infectious disease had an excellent value of the CCI from 81 to 95 days, animals with combined and infectious type of hoof disease had a satisfactory value of the CCI, i.e. 96-110 days (Burdych and Kocmánek, 2021). This fact once again confirms that early diagnosis and professional treatment of lameness in dairy cows can reduce the negative effect on reproduction (Hernandez et al., 2005; Nałęcz-Tarwacka et Jędrzejek, 2012).

#### *Evaluation of the influence of the number of affected limbs on the calving to conception interval value*

It can be seen from Figure 7 that the length of the CCI increases as the number of affected limbs increases. From an average of 77.69 days in healthy cows to an average of 106.40 days in animals with more affected limbs. Based on the results of the multiple comparisons (Table 5), a statistically significant difference in the length of the CCI can be seen between healthy animals and those with one affected limb (higher by 14.62 days on average) and with more affected limbs (higher by 28.71 days on average days). Although animals with more affected limbs had a mean CCI value of 14.09 days longer compared to animals with one affected limb, this difference was not statistically significant. This result may have been influenced by the small number of observations in the group of cows with more affected limbs.

**Table 4.** Multiple comparisons of calving to conception interval within evaluated groups of cows (non-lame, infection lameness, non-infection lameness, combined lameness)

Type of lameness	Mean CCI	Non lame	Infection lameness	Non infection lameness	Combined lameness
Non-lame	77.93		0.015 <sup>a)</sup>	0.837	0.039 <sup>a)</sup>
Infection lameness	99.97	0.015 <sup>a)</sup>		0.292	0.988
Non infection lameness	85.02	0.837	0.292		0.223
Combined lameness	103.05	0.039 <sup>a)</sup>	0.988	0.223	

Abbreviations: CCI, Calving to conception interval

<sup>a)</sup> Data are presented as statistical significance  $P < 0.05$

**Table 5.** Multiple comparisons of calving to conception interval within evaluated groups of cows (not affected limbs, one affected limb, multiply affected limbs)

	Mean CCI	Not affected limbs	One affected limb	Multiply affected limbs
Not affected limbs	77.69		0.024 <sup>a)</sup>	0.005 <sup>a)</sup>
One affected limb	92.31	0.024 <sup>a)</sup>		0.276
Multiply affected limbs	106.40	0.005 <sup>a)</sup>	0.276	

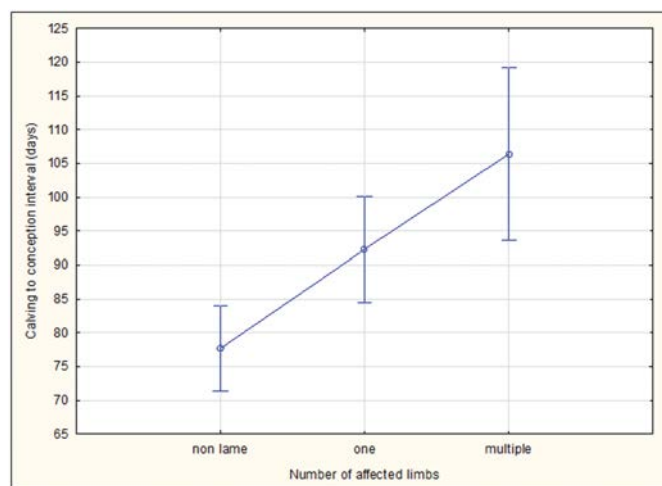
Abbreviations: CCI, Calving to conception interval

<sup>a)</sup> Data are presented as statistical significance  $P < 0.05$ 

### *Influence of evaluated parameters on the level of the number of services per conception*

Table 6 shows the overall assessment of the monitored parameters and their influence on NSC. Excellent NSC values without re-insemination are up to 1.6, good 1.6-1.9, unfavorable 2.0-2.2 and unsatisfactory above 2.2. The optimal values of the NSC with re-inseminations in Czech Fleckvieh (Simmental) are  $< 1.9$  (Burdych and Kocmánek, 2021).

During the observation, statistical significance affecting the NSC value was recorded for the parameter of multiple lameness episodes ( $P < 0.05$ ). A tendency of a negative influence on the value of the NSC was recorded for the parameter of the incidence of lameness ( $P < 0.1$ ). The factor of the cause of disease (infectious disease, non-infection disease or combined disease) and the number of affected limbs did not show any influence on the NSC value.

**Figure 7.** Graphical results of analysis of variance evaluating the effect of the number of affected limbs on the calving to conception interval**Table 6.** Evaluation of the influence of monitored factors on the value of the number of services per conception

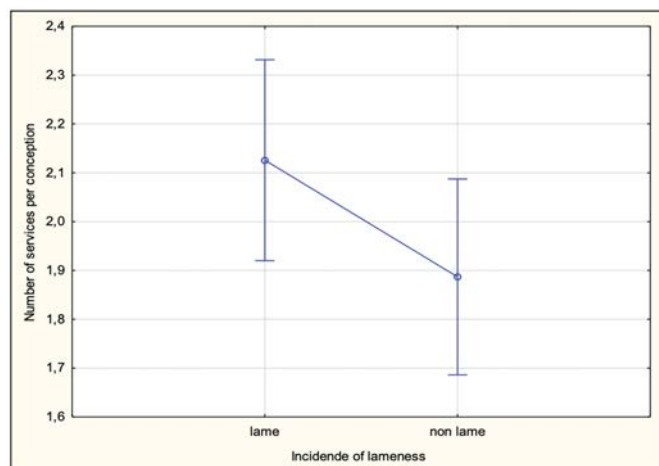
Factors	s.v.	F-test	P	Significance
Occurrence of hoof disease and lameness	1	2.68	0.100	+
Number of lameness episodes	2	3.22	0.041	*
Cause of lameness	3	1.42	0.238	-
Number of limbs affected	2	1.99	0.139	-

Data are presented as statistical significance  $P < 0.001$ (\*\*\*),  $P < 0.01$ (\*\*),  $P < 0.05$ (\*),  $P > 0.05$  (-)

### Evaluation of the influence of lameness on the level of number of services per conception

Lame animals in the observation needed an average higher number of insemination doses to become pregnant compared to healthy dairy cows (2.12 vs 1.88, Figure 8). The effect of the occurrence of lameness on NSC was not statistically significant, but the P was 0.1, indicating a trend of the monitored aspect.

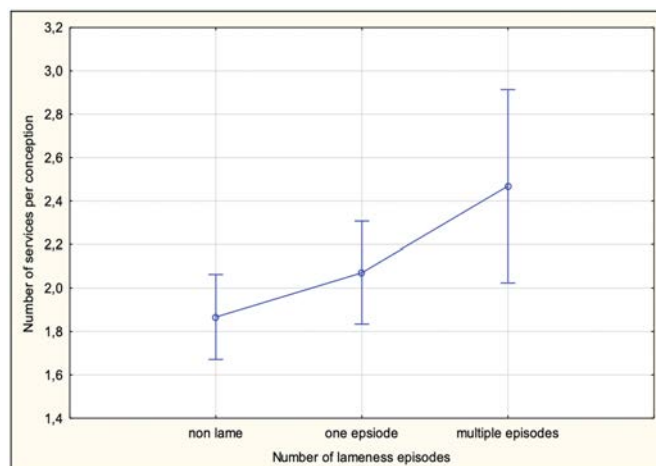
This result of the negative trend of lameness on NSC is in accordance with the work of Collick et al. (1989) or Vacek et al. (2007). The NSC result exceeds the optimal values for Czech Fleckvieh (Simmental) (Burdych and Kocmánek, 2021).



**Figure 8.** Graphical results of analysis of variance evaluating the effect of lameness on the number of services per conception

### Evaluation of the effect of the number of lameness episodes (one or multiple) on the number of services per conception

Monitoring showed that animals with multiple incidences of lameness episodes had a statistically significantly higher NSC value ( $P < 0.05$ ) compared to healthy animals (2.47 vs 1.88, Table 7). Figure 9 shows the increasing value of NSC with increasing incidence of lameness. There was no statistical difference in the value of NSC (2.07) for cows affected by one incidence of lameness. The value of NSC in both affected groups of animals was unfavorable to unsatisfactory (Burdych and Kocmánek, 2021).



**Figure 9.** Graphical results of analysis of variance evaluating the effect of the number of lameness episodes on the number of services per conception

**Table 7.** Multiple comparisons of the number of services per conception within evaluated groups of cows (non-lame, one lameness episode, multiple lameness episodes)

	Mean NSC	Non-lame	One lameness episode	Multiple lameness episodes
Non-lame	1.87		0.454	0.044 <sup>a)</sup>
One lameness episode	2.07	0.454		0.427
Multiple lameness episodes	2.47	0.044 <sup>a)</sup>	0.427	

Abbreviations: NSC, Number of services per conception

<sup>a)</sup> Data are presented as statistical significance  $P < 0.05$

## CONCLUSION

This study confirms that lameness in dairy cows is a pressing issue, which causes great losses, not only due to poor fertility. In the monitored herd, the lame cows showed 17.12 days longer calving to conception interval on average, which means they wasted almost one oestrous cycle. The losses in profitability were not negligible due to increased feed costs (more empty days), higher labour and veterinary costs, increased use of drugs and indirect losses due to a higher risk of premature culling. Based on this study regarding the cause of lameness (infectious, non-infectious, combined) it is clear that infectious and combined diseases play an important role in the incidence of lameness and, therefore have influenced the parameters monitored in this observation. The incidence of infectious hoof diseases is closely related to poor hygiene and cleanliness of hooves therefore it is strongly recommended to focus on hygiene issues of the farm. Also, the number of lameness episodes and the number of affected limbs, what we can describe as complicated cases of lameness, had a significant effect on the evaluated reproductive parameters.

In conclusion, the prevention of lameness, i.e. proper and timely hoof trimming, regular foot baths and welfare, should be an essential part of good herd management today. It is crucial to identify lame cows early and treat them immediately.

## ACKNOWLEDGEMENT

This research was funded by the Grant Agency of the University of South Bohemia in České Budějovice, No. GAJU 005/ 2022/ Z.

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