

ANALYSIS OF THE GROWTH AND DEVELOPMENT OF HOLSTEIN-FRIESIAN AND SIMMENTAL CALVES HELD IN THE “IGLOO” TYPE HUTCHES

Małgorzata Szewczuk, Karolina Turek, Piotr Sablik

West Pomeranian University of Technology, Szczecin, Poland

Abstract. The research was conducted on Holstein-Friesian (31) and Simmental (83) calves kept in “igloo” sheds until their third month of life. In Holstein-Friesian cattle easy deliveries were most common (61.3%), whilst in Simmentals there were more difficult deliveries, which required help of more than one person (54.2%). The assessment of calves’ growth and development was based on body mass at birth, body mass in subsequent months of life and daily body mass gains in given rearing period as well and health assessment. All HF calves were born healthy and heavier (+1.5 kg) than Simmental calves ($P \leq 0.05$). During the whole raising period Simmental calves had higher daily mass gains (+40 g) than HF calves. The worst season in calves raising was the summer (HF – 25.7% of sick cows) and the fall (SM – 32.4%).

Key words: body weight, daily gains, rearing of calves

INTRODUCTION

Rearing calves is an important element in milk and beef production. It influences growth and development of young animals as well and their health [Wagenaar and Langhout 2007, Szewczuk et al. 2011] and organ development, which later determine the efficiency of calves rearing and may have an effect on profits from the production [Jarmuż et al. 2001, Passille et al. 2008, Gajos 2010]. Rearing system is closely related to animal welfare and behaviour [Wagenaar and Langhout 2007, Gajos 2010].

Corresponding author: Małgorzata Szewczuk, Department of Ruminant Science, West Pomeranian University of Technology, Szczecin, Doktora Judyma 10, 71-460 Szczecin, Poland, e-mail: malgorzata.szewczuk@zut.edu.pl

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The aim of the research was to analyse growth and development as well as health of Holstein-Friesian Black-and-White and Simmental calves kept in “igloo” hutches until third month of life.

MATERIAL AND METHODS

The research was conducted at a farm mainly specialising in production of high quality beef cattle. Additionally, there also small population of dairy cattle were raised which became the object of research. The farm was situated in “Ujście Warty” National Park buffer zone (Poland). A part of the farm lays within the NATURA 2000 area. The observations was conducted on a group of 114 calves in the period of the first three months of their life. In the group there were 31 Holstein-Friesian Black-and-White calves and 83 Simmental calves. After each birth in the year, parturition ease and vitality of newborn individuals were evaluated and the calves were weighted and observed in terms of health.

The assessment of the calving was carried out based on a five-point scale: 1 – independent, natural delivery, 2 – easy delivery with human assistance, 3 – difficult delivery with assistance of more than one person and with more force than usual, 4 – difficult delivery with assistance of a vet (surgery, damage to the cow or calf), 5 – miscarriage.

The calves vitality after birth was assessed based on a three-point scale: 1 – alive, normal calf, 2 – calf dead during birth or within 24 hours, 3 – deformed calf.

Until the seventh day of life the calves were kept with their mothers and had unlimited access to colostrum. After two weeks the calves were fed with whole milk and later, until the 3rd–4th week with PROMILK D (de Heus) milk replacer three times daily.

From the beginning of the third week until the 90th day of life the calves were given feed (de Heus) *ad libitum*. The animals were fed equally, according to the accepted feeding standards. The calves were kept into igloo hutches with a stockyard outside the building, The assessment of the calves’ growth and development was based on body mass at birth and body mass in subsequent months of life (in 30th, 60th and 90th day of life). Daily mass gains were calculated in the periods: from birth to 30th day of life, from 31st to 60th and from 61st to 90th days of life. Health assessment was carried out during the whole period.

The statistical analysis was carried out using the Statistica 6.0 PL programme and included one-way variance analysis. The significance of the difference between the groups was calculated with the t-Student test.

RESULTS

The results showed (Table 1) that Holstein-Friesian cows usually had easy deliveries (61.3%) whilst in case of Simmental cows there were more difficult ones, where assistance of more than one person was required (54.2%). In neither of the breeds there were difficult deliveries with a damage to a cow. This may indicate a good veterinary and zootechnical care. However, in Simmental there were miscarriages observed (2.4%). The course of deliveries in both breeds were probably influenced by the mothers' genotypes, which was also observed by Nogalski et al. [2000], Jankowska et al. [2005] and Szewczuk et al. [2006] who pointed out that the deliveries became more difficult with the increase in the proportion of HF genes.

Table 1. Assessment of parturition ease of cows and heifers

Tabela 1. Przebieg porodów krów

Code of birth Kod porodu	HF, N = 31		SM, N = 83	
	n	%	n	%
1	9	29	11	13.3
2	10	3.3	25	30.1
3	12	38.7	45	54.2
4	–	–	–	–
5	–	–	2	2.4

The studies carried out by researchers in different countries indicated that calves mortality increased significantly in the recent years despite introduction of new techniques in calf raising [Goff 2006, LeBlanc et al. 2006, Mee 2013, Raboisson et al. 2013]. It confirms the importance of immunological and metabolic status of a newly-born calf in adaptation to the environment [Skrzypek 2002, Mee 2013, Szewczuk et al. 2013].

All HF calves (31 individuals) were born healthy, whilst in the SM calves group three out of 83 individuals were born dead or died within 24 hours after birth (Table 2). According to Skrzypek et al. [1993] the number of calves dead at birth is influenced *inter alia* by perinatal period disorders. Moreover, and the fact that the calf being born is a male may negatively influence the conduct of a delivery by causing difficulties and perinatal retention. Despite HF calves having higher body mass at birth than SM the deliveries in their cases were easier. However, this fact might have been influenced by a lower number of individuals in this group.

According to Przysucha and Grodzki [2007] the course of delivery is a complex feature influenced by various factors. Cow's predisposition to easy deliveries is associated with its mass, genital tract structure as well as hormonal mechanisms, which determine ex. cow's ability to make an effort during labor. According

Table 2. Evaluation of viability of calves

Tabela 2. Ocena żywotności cieląt

Viability of calves Żywotność cieląt	Calves HF – Cieleta HF N = 31		Calves SIM – Cieleta SIM N = 83	
	n	%	n	%
1	31	100	80	96.4
2	–	–	3	3.6
3	–	–	–	–

to Ferris et al. [2014] a course of delivery is negatively influenced by a very good condition and excessive emaciation of a cow or a heifer.

Holstein-Friesian calves were born heavier (40.3 kg) than Simmental calves (38.8 kg, $P \leq 0.05$), but in the subsequent months of life (1st, 2nd and 3rd month) Simmentals had higher body mass than HF (Table 3). In the 3rd month of life Simmental calves had the highest average body mass (105.2 kg). The differences were statistically significant ($P \leq 0.01$). The same group of animals also had the highest daily mass gains (738 g) during the entire raising period ($P \leq 0.01$, Table 4).

Table 3. Mean body weight (kg) of calves from birth to the 3rd month of rearing

Tabela 3. Średnie masy ciała (kg) cieląt od urodzenia do 3. miesiąca odchowu

Breed Rasa	Parameters Parametry	Body weight, kg – Masa ciała, kg			
		birth przy urodzeniu	1st month 1. miesiąc	2nd month 2. miesiąc	3rd month 3. miesiąc
HF (n = 31)	\bar{x}	40.3 ^a	58.9	80.2	103.1
	S	2.29	2.71	5.24	5.97
	V%	5.68	4.60	6.53	5.78
SIM (n = 83)	\bar{x}	38.8 ^a	59.9	80.1	105.2 ^a
	S	3.68	3.29	5.33	4.03
	V%	9.48	5.49	6.65	3.83

Means in columns with the same lower-case letters differ significantly at $P \leq 0.05$.

Średnie w kolumnach oznaczone tą samą małą literą różnią się istotnie na poziomie $P \leq 0,05$.

Body mass can be influenced by many factors. Choroszy et al. [2003] and Gradowska et al. [2002] demonstrated that mother's genotype and a year season are associated with calves body mass at birth and their vitality [Nogalski et al. 2000]. HF calves with 50–87.5% hf genes and born in the spring had low mean body mass at birth (37.9 kg), whilst calves with 87.6–100% of hf genes and also born in the spring had mean body mass of 39.5 kg [Gradowska et al. 2002]. According to Czaja et al. [2002] the fall calving season promotes better development of SM calves than the spring one. Also the number of calvings is of some

importance. The research by Kuczaj [2004] showed that the lowest body mass was observed in the calves from the cows which delivered for the first time. The highest body mass at birth was observed in the calves from multiparous cows after second and third calving. According to Kamieniecki et al. [1994] the nutrition of a mother significantly influenced a foetus's and later a calf's growth.

SM calves grew faster than the HF calves in the analysed period (the exception was the period between the first and the second month of life, $P \leq 0.01$). The body mass gains in SM calves during the entire study period (90 days) were similar to results obtained by Adamski et al. [2004] (717–765 g), whilst the gains of HF calves were similar to those observed by Szewczuk et al. [2013] (674–718 g). Health remains a key factor in calves raising, regardless of their breed. Czaja et al. [2002] reported that the calves which suffered from a disease during the raising period had lower body mass and therefore lower body mass gains.

Table 4. Mean values daily gains of calves from birth (g) to the 3 month of rearing

Tabela 4. Średnie wartości przyrostów dobowych (g) cieląt od urodzenia do 3. miesiąca odchowu

Breed Rasa	Parameters Parametry	Gains, g – Przyrosty, g			
		birth – 30 days urodzone – 30 dni	31–60 days 31–60 dni	61–90 days 61–90 dni	birth – 90 days urodzone – 90 dni
	\bar{x}	619 ^A	710	765 ^A	698 ^A
HF (n = 31)	S	73.92	124.48	112.2	63.92
	V%	11.94	17.54	14.68	9.16
	\bar{x}	703 ^A	675	834 ^A	738 ^A
SIM (n = 83)	S	128.56	129.34	121.35	44.49
	V%	18.30	19.20	14.60	6.00

Means in columns with the same capital letters differ significantly at $P \leq 0.01$.

Średnie w kolumnach oznaczone tą samą dużą literą różnią się istotnie na poziomie $P \leq 0,01$.

The least advantageous season for calves raising was the summer, when 25.8% of HF calves were sick (mainly with respiratory and digestive systems diseases). In the SM group the least advantageous was the spring (15.66% sick individuals, mainly with respiratory and digestive systems diseases as well as dermatomycoses). It should be noted that both calves groups were kept in exactly the same conditions, each individual separately in an “igloo” shed, and despite this, dermatomycoses were observed in SM calves in all four year seasons (Table 5).

In the last years an emphasise was put on an appropriate calves raising and therefore on the animals' health maintenance regardless of the year season. According to Szewczuk et al. [2006] HF calves born in the fall and winter most often suffer from respiratory and digestive systems diseases (8.6–14.5% and 2.8–12.1%, respectively) and they are predisposed to dermatomycoses [Sablík et al. 2000].

Table 5. Health analysis of calves from birth till the 3rd month of rearing, including season of birth

Tabela 5. Analiza zdrowotności cieląt od urodzenia do 3. miesiąca odchowu z uwzględnieniem sezonu urodzenia

Diseases Schorzenia	HF								SM							
	Birth season – Sezon urodzenia															
	Spring Wiosna		Summer Lato		Fall Jesień		Winter Zima		Spring Wiosna		Summer Lato		Fall Jesień		Winter Zima	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Airways diseases Układu oddechowego	4	12.90	5	16.13	2	6.4	2	6.4	6	7.22	2	2.41	3	3.61	3	3.61
Alimentary tract diseases Układu pokarmowego	3	9.68	3	9.68	2	6.4	2	6.4	5	6.02	6	7.23	3	3.61	3	3.61
Fungoses – Grzybice	–	–	–	–	–	–	–	–	2	2.41	1	1.20	2	2.41	1	1.20
Total – Ogółem	7	22.58	8	25.81	4	12.8	4	12.8	13	15.66	9	10.84	8	9.46	7	8.43

Choroszy et al. [2003] reported that 39.96% cases of a disease incidence in SM calves falls in the winter season.

CONCLUSIONS

The conditions of calves raising in dairy cattle production have to be taken into consideration in order to obtain high milk yield in the future. Since the very beginning the appropriate nutrition and maintenance of a pregnant cow should be ensured. The habitat needs of youth and adult animals have to be considered in ensuring not only protection against adverse external factors, but also animals' fine fettle. In order to obtain excellent results in the production of livestock buildings have to be modernised and equipped with new machinery to ensure the mechanisation of the production process. In the buildings unsuitable for rearing the animals are exposed to drafts, which lead to pulmonary inflammation and consequently to reduced body mass gains. Bad hygiene can cause diarrhoea, which similarly to pneumonia adversely affect the overall development of the animals and their productivity. The demand for high-quality animal products requires farmers to use not only adequate nutrition and veterinary care but also a proper animals' maintenance, which is beneficial to the calves' health and future profits from the production. A key role in the calves raising is played by a human factor. The results of the study indicate that the animals were provided with appropriate veterinary and zootechnical care during the perinatal period. Body mass gains of calves of both breeds were correct, which probably results from appropriate feeding and individual calves rearing.

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ANALIZA WZROSTU I ROZWOJU CIELĄT RAS HOLSZTYŃSKO-FRYZYJSKIEJ ORAZ SIMENTAL UTRZYMYWANYCH W BUDKACH TYPU „IGLOO”

Streszczenie. Badania przeprowadzono na cielętach rasy Holsztyńsko-Fryzyjskiej (31) oraz Simental (83) utrzymywanych w budkach „igloo” do 3. miesiąca życia. U krów rasy Holsztyńsko-Fryzyjskiej przeważały porody łatwe (61,3%), natomiast u krów Simental więcej był porodów trudnych (54,2%) wymagających pomocy więcej niż jednej osoby. Ocenę przebiegu wzrostu i rozwoju cieląt oparto o wyniki masy ciała przy urodzeniu, w kolejnych miesiącach życia oraz przyrosty dobowe za dany okres odchowu i ocenę zdrowotności. Wszystkie cielęta HF urodziły się zdrowe i cięższe (+1,5 kg) od Simentali ($P \leq 0.05$). Za cały okres odchowu cielęta Simental cechowały się większymi przyrostami (+40 g) od swoich rówieśników. Najbardziej niekorzystnym okresem dla odchowu cieląt okazał się sezon letni (HF – 25,7% chorych) i jesienny (SM – 32,4%).

Słowa kluczowe: masa ciała, przyrosty dobowe, odchow cieląt

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