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MAIN COMPOSITION AND MACROELEMENTS CONTENT IN MARE MILK DURING FIRST MONTH AFTER PARTURITION AND OCCURRENCE OF “HEAT DIARRHOEA” IN THEIR FOALS

PODSTAWOWY SKŁAD ORAZ ZAWARTOŚĆ MAKROELEMENTÓW
W MLEKU KLACZY PODCZAS PIERWSZEGO MIESIĄCA PO PORODZIE
A WYSTĘPOWANIE BIEGUNKI RUJOWEJ U ICH ŻREBIĄT

Summary. Till today there is no exact explanation of the phenomenon of first diarrhoea called “heat diarrhoea” in foals. The objective of this study was to investigate the traits of first foal diarrhoea (occurrence, its duration and intensity) and mares’ milk composition during first month after parturition. The research was carried out on 30 Arabian mares and their foals. Milk samples were collected to evaluate the main components and macroelements. Observations were made on the term of occurrence, length and intensity of first heat diarrhoea of foal. The close connection between mares’ milk composition and characteristics of diarrhoeas was observed in Arabian foals. Young animals characterised by lack of any diarrhoea signs have drunk milk with higher level of most studied components except lactose and magnesium. Foals with later scours drunk milk with higher level of P and Na; foals with longer diarrhoeas obtained milk with higher lactose, P and Na concentration; higher intensity was influenced by higher lactose level. This problem definitely needs further studies.

Key words: mare, milk composition, foal, heat diarrhoea

Introduction

Growth and development of foals is highly influenced by different factors during period they spend with their mothers. One of the most interesting and not really recognised phenomena is first foals diarrhoea called “heat diarrhoea” or “heat scours”. This diarrhoea occurs during first 2-3 weeks after foal’s birth in most of horses breeds

(DESKUR et AL. 1978, GUSTAFSSON 1998). Till today there is no exact explanation of this phenomenon – most veterinarians describe it as a pathological infections due to viruses or bacteria, parasitologists explain it as an early invasions of some nematodes, physiologists describe it as a results of changing in intestines and breeders clarify it as a results of changing in mare's milk compositions related to her heat. Hormonal changes in mare due to her heat can cause changes in chemical composition of milk (content of main components and mineral elements) and also the changes in physiology of intestine of foals. The objective of this study was to investigate the traits of first foal diarrhoea (occurrence, its duration and intensity) and mares' milk composition during first month after parturition.

Material and methods

The research was carried out on 30 Arabian mares and their foals. Milk samples were collected to evaluate the main components and macroelements. The first milking was performed on 2nd day after parturition when the milk has changed from colostrum (TISCHNER et AL. 1996). Samples were then collected every 2 days until 30 days after birth. Milk samples (about 150 ml) were obtained manually milking into sterile, plastic bottles with procaine penicillin as a preservative, then frozen to -20°C until chemical analysis. Main components content (total fat, total protein, lactose and dry matter (d.m.) as a percentage of raw milk) was evaluated using Milcoscan apparatus. For macroelement levels evaluation (in milligrams per 1 kg of milk) all samples were lyophilized in Labor-Mim 90 apparatus and then mineralized in acids mixture (1 nitric acid : 1.5 perchloric acid). Ash samples obtained were dissolved in distillate water and analysed with the Philips PU 9100 apparatus. Phosphorus level was evaluated according to colorimetric method of Gericke and Kurmies (SKUMOWSKI 1975) using Unicam apparatus. Observations were made on the term of occurrence, length and intensity of first foal diarrhoea (heat diarrhoea), during the first month of the foals' life. Studied population of foals was then divided into groups as follows in Table 1.

Table 1. Groups of studied foals according to the term of occurrence, duration and intensity of heat diarrhoea

Tabela 1. Grupy źrebiąt w zależności od terminu wystąpienia, czasu trwania i nasilenia biegunki rujowej

Group Grupa	Term of occurrence Termin wystąpienia	Duration Czas trwania	Intensity Nasilenie
1	2	3	4
1	Foals without diarrhoea Źrebięta bez biegunki	–	–
2	≤ 7 days after birth ≤ 7 dni po urodzeniu	≤ 6 days ≤ 6 dni	1 pt – mild course (moist croup and tail) 1 pkt – łagodny przebieg (wilgotny zad i ogon)

Table 1 – cont. / Tabela 1 – cd.

1	2	3	4
3	≥ 8 days after birth ≥ 8 dni po urodzeniu	> 6 days > 6 dni	2 pt – average course (wet, dirty croup and tail) 2 pkt – średnio nasilony przebieg (mokry, brudny zad i ogon)
4	–	–	3 pt – intensive course (very wet and dirty croup, tail and legs and foamy, smelly faeces) 3 pkt – intensywny przebieg (bardzo mokre i brudne zad, ogon i nogi oraz pienne, cuchnące odchody)

Data were analysed using the computer program Statistica for Windows 8.0. One-factor variance analysis ANOVA and then Tukey's test were used for evaluation of statistical differences between particular groups of foals in the level of studied milk components.

Results

25 from 30 of the observed foals showed signs of diarrhoea as this is the focus of the study. The other young horses were characterised by diarrhoea of different terms, length and intensity. The shortest diarrhoea was noted in two foals (2 days) and the longest (11 days) in one foal. Foals without diarrhoea at all were drinking milk with significantly higher level of total fat (1.77%), dry matter (11.24%) and potassium (664.1 mg/kg milk) and with significantly lower level of lactose (6.15%) compare to foals with diarrhoeas. Foal with later diarrhoeas obtained milk with higher level of phosphorus (776.4 mg/kg milk) and sodium (135.3 mg/kg milk) than other foals but differences between particular groups were not statistically significant (Table 2).

According to diarrhoeas length it was observed that foals with longer diarrhoeas drunk milk with significantly lower level of total fat (1.64%), dry matter (11.04%) and calcium (881.1 mg/kg milk). Also the level of total protein was lower but the differences were not statistically significant. Mothers of foals from this group produced milk with significantly higher level of lactose (6.20%). Foals without diarrhoea drunk milk richer in most studied components (Table 3).

Similar results were obtained during the analysis of milk composition of mothers of foals with different intensity of diarrhoea. Foals with the most intensive scours obtained milk with significantly lower level of fat (1.65%), dry matter (11.04%) and potassium (589.9 mg/kg milk) and with significantly higher level of lactose (6.22%). Also the total protein content was the lowest in this group but the differences were not statistically significant (Table 4).

Table 2. Term of heat diarrhoea occurrence in foals depending on content of main components and macroelements in mares milk

Tabela 2. Termin wystąpienia biegunki rujowej u źrebiąt w zależności od zawartości składników podstawowych i makroelementów w mleku klaczy

Term of diarrhoea occurrence Termin wystąpienia biegunki	N	Main components Składniki podstawowe (%)				Macroelements in 1 kg of milk Makroelementy w 1 kg mleka (mg)				
		fat tłuszcz	protein białko	lactose laktoza	d.m. s.m.	Ca	P	Mg	Na	K
1. Foals without diarrhoea 1. Żrebięta bez biegunki	6	1.77 ab	2.62	6.15 a	11.24 ab	971.6 A	718.2	91.9 a	131.9	664.1 A
SD		0.43	0.52	0.21	0.59	248.8	236.2	37.8	24.6	169.2
2. ≤ 7 days after birth 2. ≤ 7 dni po urodzeniu	11	1.64 a	2.52	6.21 a	11.07 a	869.6 Aa	713.4	101.0 ab	127.7	594.4 AB
SD		0.43	0.54	0.21	0.58	248.1	238.2	36.7	24.5	168.4
3. ≥ 8 days after birth 3. ≥ 8 dni po urodzeniu	13	1.66 b	2.52	6.19	11.05 b	937.7 a	776.0	91.9 b	135.3	658.9 B
SD		0.38	0.44	0.20	0.63	247.8	237.7	36.9	24.5	173.3
Total Ogółem	30	1.67	2.54	6.19	11.09	913.8	739.2	95.9	132.0	631.8
SD		0.40	0.51	0.20	0.63	248.3	237.3	36.8	24.6	170.2

Averages marked in columns with the same small letter differ significantly ($p < 0.05$).

Averages marked in columns with the same capital letter differ highly significantly ($p < 0.01$).

Średnie oznaczone w kolumnach tą samą małą literą różnią się istotnie ($p < 0,05$).

Średnie oznaczone w kolumnach tą samą dużą literą różnią się wysoko istotnie ($p < 0,01$).

Many authors observed similar values of most studied components of mares milk (DOREAU et AL. 1993, MARIANI et AL. 1993, PAGLIARINI et AL. 1993, CSAPO-KISS et AL. 1995, POOL-ANDERSON et AL. 1994, MARCONI and PANFILI 1998) but there were only two positions of literature concerning foals' heat diarrhoea fund (JOHNSTON et AL. 1970, DESKUR et AL. 1978). These two last works did not answer the question if there is any connection between mares milk composition and foals' first diarrhoea occurrence.

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Table 3. Duration of heat diarrhoea in foals depending on content of main components and macroelements in mares milk

Tabela 3. Czas trwania biegunki rujowej u źrebiąt w zależności od zawartości składników podstawowych i makroelementów w mleku klaczy

Duration of diarrhoea Czas trwania biegunki	N	Main components Składniki podstawowe (%)				Macroelements in 1 kg of milk Makroelementy w 1 kg mleka (mg)				
		fat tłuszcz	protein białko	lactose laktoza	d.m. s.m.	Ca	P	Mg	Na	K
1. Foals without diarrhoea 1. Źrebięta bez biegunki	6	1.77 Aa	2.62	6.15 a	11.24 Aa	971.6 A	718.2	91.9	131.9	664.1 ab
SD		0.46	0.54	0.22	0.57	248.5	237.4	36.6	24.2	168.9
2. ≤ 6 days 2. ≤ 6 dni	14	1.67 a	2.53	6.19	11.09 a	929.2	712.3	97.7	126.7 a	620.2 a
SD		0.39	0.45	0.20	0.62	248.8	237.0	37.1	24.5	172.2
3. > 6 days 3. > 6 dni	10	1.64 A	2.51	6.20 a	11.04 A	881.1 A	767.9	95.75	136.3 a	629.4 b
SD		0.42	0.51	0.21	0.59	248.1	237.2	36.8	24.6	168.2
Total Ogółem	30	1.67	2.54	6.19	11.09	913.8	739.2	95.9	132.0	631.8
SD		0.40	0.51	0.20	0.63	248.3	237.3	36.8	24.6	170.2

Averages marked in columns with the same small letter differ significantly ($p < 0.05$).

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Conclusions

The close connection between mares milk composition and characteristics of diarrhoeas was observed in Arabian foals. Young animals characterised by lack of any diarrhoea signs have drunk milk with higher level of most studied components except lactose and magnesium. Foals with later scours drunk milk with higher level of P and Na; foals with longer diarrhoeas obtained milk with higher lactose, P and Na concentration; higher intensity was influenced by higher lactose level. This problem definitely needs further studies.

Table 4. Intensity of heat diarrhoea in foals depending on content of main components and macroelements in mares milk

Tabela 4. Nasilenie biegunki rujowej u źrebiąt w zależności od zawartości składników podstawowych i makroelementów w mleku klaczy

Intensity of diarrhoea Nasilenie biegunki	N	Main components Składniki podstawowe (%)				Macroelements in 1 kg of milk Makroelementy w 1 kg mleka (mg)				
		fat tłuszcz	protein białko	lactose laktoza	d.m. s.m.	Ca	P	Mg	Na	K
1. Foals without diarrhoea 1. Źrebięta bez biegunki	6	1.77 ab	2.62	6.15 A	11.24 ab	971.6 a	718.2	91.9 a	131.9	664.1 A
SD		0.33	0.41	0.19	0.66	249.4	236.1	36.6	24.4	170.1
2. Mild course (1 pt) 2. Łagodny przebieg (1 pkt)	10	1.63 a	2.50	6.20	11.03 a	877.7 ab	749.8	94.6	133.3	637.5 a
SD		0.42	0.51	0.21	0.59	248.1	237.2	36.8	24.6	168.2
3. Average course (2 pt) 3. Średnio nasilony przebieg (2 pkt)	9	1.71	2.63	6.13 B	11.17	947.2 b	765.8	104.6 a	130.1	680.6 Ba
SD		0.39	0.45	0.20	0.62	248.8	237.0	37.1	24.5	172.2
4. Intensive course (3 pt) 4. Intensywny przebieg (3 pkt)	5	1.65 b	2.50	6.22 AB	11.04 b	911.4	727.5	95.9	131.5	589.9 AB
SD		0.43	0.52	0.20	0.60	248.0	236.6	36.4	24.4	170.2
Total Ogółem	30	1.67	2.54	6.19	11.09	913.8	739.2	95.9	132.0	631.8
SD		0.40	0.51	0.20	0.63	248.3	237.3	36.8	24.6	170.2

Averages marked in columns with the same small letter differ significantly ($p < 0.05$).

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Średnie oznaczone w kolumnach tą samą dużą literą różnią się wysoko istotnie ($p < 0,01$).

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PODSTAWOWY SKŁAD ORAZ ZAWARTOŚĆ MAKROELEMENTÓW W MLEKU KLACZY PODCZAS PIERWSZEGO MIESIĄCA PO PORODZIE A WYSTĘPOWANIE BIEGUNKI RUJOWEJ U ICH ŹREBIĄT

Streszczenie. Do dzisiaj nie istnieje dokładne wyjaśnienie zjawiska pierwszej biegunki, zwanej „biegunką rujową”, u źrebiąt. Celem niniejszej pracy było zbadanie związku pomiędzy terminem wystąpienia, czasem trwania i intensywnością biegunki rujowej a składem mleka klaczy matki w czasie pierwszego miesiąca po porodzie. Badania przeprowadzono na 30 klaczach arabskich i ich źrebiętach. Próbkę mleka zebrano w celu analizy zawartości składników podstawowych i makroelementów. Przeprowadzono również obserwacje dotyczące terminu wystąpienia, długości i intensywności pierwszej biegunki rujowej u źrebiąt. Odnotowano ścisły związek między składem mleka klaczy i cechami biegunek u źrebiąt arabskich. Sysaki charakteryzujące się brakiem biegunki pobierały mleko o wyższym poziomie większości badanych składników, oprócz magnezu i laktozy. Źrebięta, u których biegunki występowały później, piły mleko o wyższym poziomie fosforu i sodu; źrebięta z dłuższymi biegunkami odżywiały się mlekiem z wyższym poziomem laktozy, P i Na; większa intensywność biegunki była związana z większą koncentracją laktozy. Problem ten na pewno wymaga dalszych badań.

Słowa kluczowe: klacz, skład mleka, źrebię, biegunka rujowa

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