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Effects of social hierarchy-related stress on hormonal reactivity and milk production in dairy cows at a commercial dairy complex

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Abstract. Regrouping disrupts established social relationships among dairy cows. Temporary overstocking additionally increases competition for feed, water, and lying space. The aim of this study was to evaluate the hormonal and production responses of cows with different stress-resistance types to social hierarchy-related stress at a commercial dairy complex. Cortisol and adrenaline concentrations were measured in 86 lactating cows before and 12 hours after 36 additional cows were introduced into a 540 m^2 pen; the cows were classified by stress-resistance type from basal cortisol, and daily milk yield, milk fat, and milk protein were assessed. Low, unstable, and high stress resistance was identified in 13 cows (15.12%), 55 cows (63.95%), and 18 cows (20.93%), respectively. Cortisol increased from 129.86 to 138.23 nmol/L in low-resistance cows, decreased from 72.33 to 68.89 nmol/L in unstable cows, and remained almost unchanged in high-resistance cows, at 47.21 and 48.03 nmol/L. At 12 hours, adrenaline was lower than baseline by 35.13%, 41.00%, and 14.12%, respectively. Daily milk yield decreased by 4.18 kg, or 14.88%, in low-resistance cows and by 1.28 kg, or 4.62%, in unstable cows, whereas it increased by 0.39 kg, or 1.30%, in high-resistance cows. Milk fat decreased by 2.96%, 6.63%, and 0.46%, respectively, whereas

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milk protein changed by -0.46%, -2.26%, and +3.13%. Correlations between post-challenge cortisol and milk yield were 0.33, 0.18, and 0.45, respectively; all 95% confidence intervals included zero and all p values exceeded 0.05. Low-resistance cows had the greatest risk of production loss and should be managed using low-disruption regrouping procedures and reduced competition for essential resources

Keywords: herd regrouping; social competition; basal cortisol; adrenaline; daily milk yield; stocking density; individual reactivity

Introduction

The intensification of dairy farming is accompanied by larger management groups, regular movement of animals between pens, and greater competition for feed-bunk space, drinking points, and lying areas. For a herd animal, these changes involve not only physical relocation but also the need to re-establish dominance and subordinate relationships. During the first hours after unfamiliar cows are mixed, displacements become more frequent, feeding behaviour and resting patterns change, and the physiological cost of adaptation depends on individual reactivity.

A recent review showed that social mixing most consistently alters activity, resting time, and the frequency of agonistic interactions, whereas evidence regarding hormonal and production consequences remains heterogeneous (Hubbard *et al.*, 2021). Prolonged social instability can also interact with nutritional and technological stressors and contribute to impaired health and production (Proudfoot & Habing, 2015). Social hierarchy is not a fixed linear attribute of an individual cow. Rank depends on context, resource availability, group composition, and the method used to calculate it. M.F. Bouissou *et al.* (2001) showed that dominance relationships in cattle depend on age, body size, experience, and the context in which animals compete. J. Krahn *et al.* (2024) subsequently demonstrated that group size affects the number and distribution of agonistic interactions among dairy cows. Thus, when resources are limited, an observed competitive advantage may reflect not only stable social rank but also the animal's current motivation. In this study, the term "social hierarchy-related stress" therefore refers to stress induced by regrouping and temporary overstocking, rather than to a previously measured rank for each cow.

Individual variation in the response has practical importance for dairy production. Sociability, fearfulness, and coping style determine how an animal modifies its behaviour when encountering competitors (Nogues *et al.*, 2020). Under restricted feed access, individual differences may become more pronounced because competition changes feeding behaviour and access to the ration (DeVries, 2019). Physiological status and production level can also modify cortisol concentrations and their relationship with milk production (Tallo-Parra *et al.*, 2018). These factors can modify the response to regrouping and should be considered when hormonal and production outcomes are interpreted. At commercial dairy complexes, both the average herd response and within-herd heterogeneity are important. Cows in the same management group may differ substantially in basal hormonal activity, behaviour, and their ability to maintain milk yield during a combined social and management challenge. Preliminary classification based on basal cortisol can help identify categories of animals at increased risk of production loss. The objective of the study was to evaluate changes in cortisol and adrenaline concentrations, daily milk yield, and major milk components in cows of different stress-resistance types after regrouping and temporary overstocking within a single commercial cohort.

Literature Review

The social organisation of cattle combines dominance relationships with selective affiliative bonds. Familiar animals may provide social support during relocation or regrouping. J.L. Rault (2012) concluded that the presence of familiar conspecifics can reduce behavioural and physiological responses to adverse events. This supports moving cows in small, familiar subgroups whenever farm organisation permits. Parity and previous social experience also affect the response to mixing. C.J.C. Phillips & M.I. Rind (2001) compared mixed and unmixed groups of primiparous and multiparous cows. Milk yield in mixed cows was 3% lower during the first week and remained approximately 1% lower during the following six weeks. Mixed cows spent less time grazing and more time standing, indicating that changes in feeding behaviour can contribute to production losses.

Regrouping causes the most pronounced changes immediately after animals are introduced into a new pen. J. Denham & A. Adams Progar (2023) observed changes in salivary cortisol and behaviour in both newly introduced and resident Holstein heifers after regrouping. A review by A.J. Hubbard *et al.* (2021) confirmed the consistency of behavioural responses but noted heterogeneous evidence for endocrine, immune, and production consequences. Competition for feed-bunk space intensifies social pressure. Reduced feed-bunk allowance increases the frequency of displacements and can restrict feeding opportunities, especially for subordinate cows (DeVries, 2019). J. Lyu *et al.* (2023) likewise found that group size and regrouping affected physiological stress indicators and behaviour in dairy calves. These mechanisms are important for interpreting an experiment in which both group composition and space allowance per cow changed simultaneously.

The physiological response to social competition does not always correspond to overt aggression. Cortisol is a widely used indicator of hypothalamic-pituitary-adrenal axis activity, but it should be interpreted according to stressor duration, circadian rhythm, physiological status, and the sampling procedure (Möstl & Palme, 2002; Mormède *et al.*, 2007). Repeated venipuncture can itself influence plasma cortisol concentrations (Hopster *et al.*, 1999). C.E. Hernández *et al.* (2014) demonstrated that peak salivary cortisol occurs later than peak plasma cortisol after a stressful procedure in dairy cattle. N.J. Cook (2012) therefore recommended standardising sampling time, animal handling, sample medium, and laboratory processing. The relationship between social contacts and production is also inconsistent. Some cows maintain milk production despite changes in behaviour, whereas others experience a marked short-term decline. Overall, the literature indicates that hierarchy-related stress should be assessed by jointly considering the nature of the challenge, hormonal markers, and individual production dynamics rather than inferring stress from a single behavioural or endocrine measure.

Materials and Methods

Experimental animals and housing conditions. The study was conducted in 2023 at the Pobeda LLP breeding farm in the Pavlodar Region, Republic of Kazakhstan. The field phase was carried out from August to November 2023. The experiment included 86 clinically healthy lactating cows from a single commercial herd. The cohort comprised 27 Holstein, 31 Red Steppe, and 28 Simmental cows. Animals were matched for stage of lactation, live weight, and production status. According to the selection characteristics of the production groups, the cows were approximately 3-6 years old, with a mean age of 4.3 years. They were in their second to fourth lactations, at approximately 90-210 days in milk, with a mean of 148 days. Live weight ranged from approximately 520 to 650 kg and averaged 575 kg. Production status corresponded to an average baseline daily milk yield of 28.29 kg per cow. Cows showing clinical signs of udder, limb, or reproductive disease were excluded.

Cows were loose-housed in pens at a commercial dairy farm. The production sections normally contained 70-90 cows and were formed according to lactation stage and productivity. Each section had automatic drinking points, a feed bunk, and individual lying places with rubber flooring and straw bedding renewed daily. Automatic scrapers removed manure at approximately 20-minute intervals, and three industrial fans were installed above each section. Before the experiment, the animals were placed in a stable management group and maintained with an unchanged composition for one month to allow adaptation to the facility and stabilisation of social relationships. The experimental pen had a total area of 540 m^2, equivalent to approximately 6.2 m^2 per cow. During the experimental period, indoor air temperature ranged from approximately 14 to 22°C, relative humidity from 50 to 68%, and air velocity from 0.2 to 0.4 m/s. These conditions were within the thermoneutral range for adult dairy cows and reduced the likelihood that heat stress substantially affected the regrouping response. Animals had free access to drinking water and a total mixed ration. The approximate daily ration per cow consisted of 24.0 kg of maize silage, 12.0 kg of haylage, 3.0 kg of mixed-grass hay, 3.0 kg of barley grain, 1.5 kg of maize grain, 2.0 kg of rapeseed meal, 1.5 kg of sunflower meal, and 0.2 kg of vitamin–mineral premix. The ration supplied approximately 23 kg of dry matter per cow per day and contained about 15.5% crude protein, 33% neutral detergent fibre, and 10.6 MJ of metabolisable energy per kilogram of dry matter. Milking was performed twice daily at 05:00 and 17:00 in a herringbone milking parlour. The 24-place milking installation was manufactured by Westfalia, Germany.

Experimental procedures and statistical analysis. Social hierarchy-related stress was induced by combining regrouping with temporary overstocking. In the evening, 36 cows from another management group were introduced into the pen containing the adapted experimental animals. The total number of cows in the pen increased to 122, and the space allowance declined to 4.4 square metres per cow. The 36 introduced cows created the experimental challenge but were not included in the statistical analysis of the original 86-cow cohort. The challenge lasted 12 hours. Baseline measurements were obtained under resting conditions before regrouping. Repeat blood sampling and a test milking were performed the following morning after the 12-hour challenge. Individual daily milk yields for the 15 days before and 15 days after regrouping were also extracted from the farm database to assess short-term recovery of production.

Blood was collected from the coccygeal vein 30 minutes after morning milking within the same time window for all cows. Serum-separator tubes were used for hormone measurements. Samples were transported in an insulated container at no more than 4 degrees Celsius and delivered to the laboratory within two hours of collection. Cortisol and adrenaline concentrations were determined using a solid-phase enzyme-linked immunosorbent assay on a Tecan Infinite F50 microplate reader, with optical density measured at 450 and 620 nanometres. The analyser was manufactured by Tecan Austria GmbH, Grödig, Austria. Bovine Cortisol ELISA and Bovine Epinephrine/Adrenaline EPI ELISA kits manufactured by Shanghai BlueGene Biotech Co., Ltd., Shanghai, China, were used, and hormone concentrations were calculated from the corresponding calibration curves. Milk fat and protein percentages were measured using a Laktan 700 infrared analyser. The analyser was manufactured by Sibagropribor LLC, Krasnoobsk, Novosibirsk Region, Russian Federation. All baseline and post-challenge samples were analysed using the same protocol. Stress-resistance type was determined from basal cortisol concentration using a uniform classification algorithm. The number of frequency intervals was estimated with Sturges' rule, after which the mean and standard error were calculated. Values above M + 3m were classified as low stress resistance, values below M – 3m as high stress resistance, and intermediate values as unstable stress resistance. The approach is protected by Utility Model Patent No. 9336 of the Republic of Kazakhstan (Patent for Utility Model No. 9336, 2024). Cows were then assigned to one of the three stress-resistance types.

For each stress-resistance type, means were weighted by sample size and variances reconstructed from residual and between-mean components. Type proportions are reported with 95% Wilson confidence intervals and means with 95% t-distribution confidence intervals. Changes were expressed in absolute units, percentages, and relative to the baseline standard deviation (Δ/SD_0); absolute values below 0.20 were considered negligible, 0.20-0.49 small, 0.50-0.79 moderate, and 0.80 or greater large. Overall correlation coefficients were estimated on Fisher's z scale using n – 3 weights, with 95% confidence intervals and two-sided p values. Because individual paired observations were unavailable, confidence intervals and p values for pre–post differences were not reconstructed. Confirmatory analysis should use an individual-level linear mixed-effects model with fixed effects of time, stress-resistance type, and their interaction, adjustment for parity and stage of lactation, and a random intercept for cow. The study complied with the European Convention for the Protection of Animals Kept for Farming Purposes (1976), the European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes (1986), and Law of the Republic of Kazakhstan No. 97-VII (2021). Trained personnel performed all procedures and minimised restraint time.

Results and Discussion

Of the 86 cows, 55 (63.95%) were classified as unstable, 13 as low-resistance, and 18 as high-resistance; Wilson intervals were wider for the smaller low-resistance type (Table 1).

Table 1. Distribution of cows by stress-resistance type

Stress-resistance type	n	%	95% CI for proportion, %
Low	13	15.12	9.05-24.16
Unstable	55	63.95	53.41-73.30
High	18	20.93	13.67-30.68

Note: 95% confidence intervals for proportions were calculated using the Wilson method (n = 86)
Source: authors' calculations based on the study data

During the first hours after the new animals were introduced, sniffing, displacements, physical confrontations, increased movement at the feed bunk, restricted access to water, and insufficient lying space were recorded. Some animals remained in the passages because all lying places were occupied. These observations were descriptive and were not analysed using a formal ethogram. In the full cohort, the most consistent increase in cortisol occurred in low-resistance cows: the mean concentration increased by 8.37 nmol/L, or 6.45%. The standardised change was 0.25 baseline standard deviations and represented a small effect. In the unstable type, mean cortisol decreased by 4.77%, with a small standardised effect of -0.36; the wide post-challenge interval reflected pronounced heterogeneity in individual responses. In the high-resistance type, the change was negligible at 1.73%, or 0.07 baseline standard deviations (Table 2, Fig. 1).

Table 2. Changes in cortisol concentration by stress-resistance type

Type	n	Baseline, nmol/L, mean ± SE [95% CI]	Post-challenge, nmol/L, mean ± SE [95% CI]	Change, %	Δ/SD_0
Low	13	129.86 ± 9.45 [109.27-150.45]	138.23 ± 7.57 [121.74-154.72]	+6.45	+0.25
Unstable	55	72.33 ± 1.29 [69.74-74.92]	68.89 ± 3.56 [61.76-76.02]	-4.77	-0.36
High	18	47.21 ± 2.64 [41.64-52.78]	48.03 ± 1.90 [44.02-52.04]	+1.73	+0.07

Note: SE – standard error; CI – confidence interval; Δ/SD_0, – change standardised to the baseline standard deviation
Source: authors' calculations based on the study data

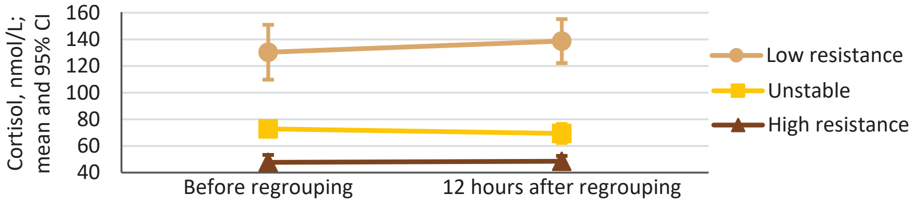

Figure 1. Changes in cortisol concentration after regrouping in the full study sample
Source: authors' calculations based on the study data

Adrenaline concentration 12 hours after regrouping was lower than baseline in all stress-resistance types. The decrease was 35.13% in the low-resistance type, 41.00% in the unstable type, and 14.12% in the high-resistance type. The standardised effect was moderate in low-resistance cows and small in unstable and high-resistance cows. This finding should not be interpreted as an absence of an acute stress response: the catecholamine response develops rapidly, and sampling at 12 hours probably captured a recovery phase. The remaining high variability supports the inclusion of several early sampling time points in future studies (Table 3).

Table 3. Changes in adrenaline concentration by stress-resistance type

Type	n	Baseline, pg/mL, mean ± SE [95% CI]	Post-challenge, pg/mL, mean ± SE [95% CI]	Change, %	Δ/SD_0
Low	13	70.68 ± 12.06 [44.41-96.95]	45.85 ± 7.60 [29.29-62.40]	-35.13	-0.57
Unstable	55	65.13 ± 7.22 [50.64-79.61]	38.43 ± 1.99 [34.44-42.42]	-41.00	-0.50
High	18	55.30 ± 5.97 [42.69-67.90]	47.49 ± 7.80 [31.03-63.95]	-14.12	-0.31

Note: change estimates are descriptive; paired covariance was unavailable in the summary report
Source: authors' calculations based on the study data

Analysis of the full cohort revealed a gradient in production stability. In low-resistance cows, daily milk yield decreased from 28.08 to 23.90 kg, a reduction of 4.18 kg or 14.88%. The standardised change of −0.66 represented a moderate negative effect. In the unstable type, the decrease was 1.28 kg or 4.62%, with a negligible standardised effect of −0.18. High-resistance cows largely maintained their average milk yield, which was 0.39 kg or 1.30% above baseline; the standardised change of 0.06 was negligible (Table 4, Fig. 2).

Table 4. Changes in adrenaline concentration by stress-resistance type

Type	n	Baseline, kg, mean ± SE [95% CI]	Post-challenge, kg, mean ± SE [95% CI]	Change, kg	Change, %	Δ/SD_0
Low	13	28.08 ± 1.75 [24.26-31.90]	23.90 ± 1.86 [19.84-27.96]	-4.18	-14.88	-0.66
Unstable	55	27.66 ± 0.94 [25.77-29.54]	26.38 ± 1.00 [24.38-28.38]	-1.28	-4.62	-0.18
High	18	30.35 ± 1.47 [27.25-33.45]	30.74 ± 1.28 [28.05-33.44]	+0.39	+1.30	+0.06

Source: authors' calculations based on the study data

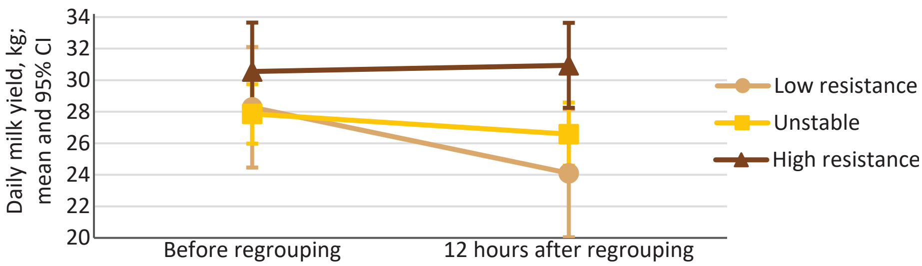

Figure 2. Changes in daily milk yield after regrouping in the full study sample
Source: authors' calculations based on the study data

Changes in milk composition were less pronounced than changes in yield. Milk fat decreased most markedly in the unstable type, by 6.63%; the standardised effect of -0.47 was small and approached a moderate magnitude. Milk fat decreased by 2.96% in the low-resistance type and by 0.46% in the high-resistance type. Milk protein was nearly unchanged in the low-resistance type, decreased by 2.26% in the unstable type, and increased by 3.13% in the high-resistance type. The latter represented a moderate descriptive effect but should be interpreted cautiously because individual paired covariance was unavailable (Table 5).

Table 5. Changes in milk fat and protein percentages by stress-resistance type

Type	n	Baseline milk fat, %	Post-challenge milk fat, %	Change in milk fat, %	Baseline milk protein, %	Post-challenge milk protein, %	Change in milk protein, %
Low	13	4.93 ± 0.19	4.78 ± 0.18	-2.96	2.82 ± 0.02	2.80 ± 0.04	-0.46
Unstable	55	4.90 ± 0.09	4.58 ± 0.08	-6.63	2.82 ± 0.03	2.76 ± 0.02	-2.26
High	18	4.71 ± 0.18	4.69 ± 0.15	-0.46	2.77 ± 0.04	2.86 ± 0.01	+3.13

Note: percentage changes were calculated from unrounded pooled values; minor differences arising from the rounded means are due to rounding
Source: authors' calculations based on the study data

Correlations between post-challenge cortisol and daily milk yield were positive but statistically inconclusive. The overall coefficient was 0.33 for the low-resistance type (95% confidence interval, -0.56 to 0.87; p = 0.496), 0.18 for the unstable type (-0.10 to 0.44; p = 0.213), and 0.45 for the high-resistance type (-0.16 to 0.82; p = 0.141). All confidence intervals included zero; therefore, the data do not support a consistent linear association between cortisol and milk yield within stress-resistance type. Cortisol should be regarded as one component of a multidimensional stress response rather than as a stand-alone universal predictor of production (Table 6).

Table 6. Correlation between post-challenge cortisol and daily milk yield by stress-resistance type

Type	n	r	95% CI	p
Low	10	0.33	-0.56-0.87	0.496
Unstable	55	0.18	-0.10-0.44	0.213
High	18	0.45	-0.16-0.82	0.141

Note: n is the number of cows with source data available for correlation analysis; the correlation coefficient was not reported for three low-resistance cows in the source report. Overall coefficients were calculated on Fisher's z scale using n − 3 weights; p is the two-sided value for testing a null correlation. The p values are exploratory and were not adjusted for multiple comparisons
Source: authors' calculations based on the study data

Findings for the full commercial cohort are consistent with evidence that the consequences of regrouping depend not only on the mean herd response but also on individual coping strategy. Vulnerability in the low-resistance type was expressed as both increased cortisol and a moderate decline in milk yield. The high-resistance type showed minimal changes in both outcomes. The unstable type had an intermediate production response but pronounced heterogeneity in its hormonal response. J.L. Marumo *et al.* (2024) studied 52 lactating cows moved in familiar groups of three to five animals into established pens of approximately 100 cows. Primiparous cows produced 3.80 ± 2.42 kg, or 12.2%, less milk on the first day after regrouping, whereas multiparous cows did not show a comparable decline. The 14.88% reduction in low-resistance cows in the present study was similar in magnitude, although the current classification was based on basal cortisol rather than parity. J.L. Marumo *et al.* (2024) also reported a decrease in milk fat of approximately 0.2 percentage points in both parity groups, while the present study found the largest relative reduction in milk fat in unstable cows, at 6.63%.

J. Brouček *et al.* (2015) examined 41 Holstein cows transferred to unfamiliar housing and a new milking system. Mean daily milk yield declined from 30.97 ± 7.26 to 23.76 ± 7.21 kg on the first day and recovered to 32.16 ± 8.87 kg by day 14. Their initial decline was greater than the pooled reduction in the present study, probably because their cows were exposed simultaneously to unfamiliar housing, relocation, and a different milking system. Both studies nevertheless indicate that the greatest production losses occur immediately after disruption. D.J.S. Jung *et al.* (2024) found that regrouping increased cortisol in dairy heifers on the first day. Regrouped heifers experienced 9.42 displacements per day compared with 2.64 in non-regrouped animals, while the difference had largely disappeared by day 7. These results correspond with the increased displacements and competition observed during the first hours of the present experiment. In contrast to the uniform group response reported by D.J.S. Jung *et al.* (2024) cortisol responses in the present study differed among stress-resistance types.

M. Soonberg *et al.* (2021) reported that motion index, step count, and lying-bout frequency changed more strongly in heifers than in experienced cows after group transitions. Cows initiated 7.04 ± 1.19 aggressive acts per hour compared with 3.66 ± 1.05 among heifers, whereas heifers received more aggressive interactions. These findings suggest that parity and previous regrouping experience may explain part of the individual variation observed in the present cohort. Regrouping was accompanied by a reduction in space allowance per cow; consequently, the observed effect reflects the combined influence of social instability and resource competition. In practice, low-resistance cows should be moved in familiar subgroups, provided with adequate feed-bunk, drinking, and lying space, and not transferred into an already overstocked pen. Use of the full commercial cohort produced more stable descriptive estimates for the three stress-resistance types but did not replace analysis of individual-level data. The summary report did not contain the covariance of paired measurements, so formal p values for change over time could not be reconstructed. In addition, the experiment was conducted on one farm and included a single regrouping event, while sampling at 12 hours did not capture the early adrenaline peak. External validation is required in independent herds using repeated regrouping events, multiple sampling time points, direct recording of agonistic interactions, and a linear mixed-effects model at the individual-cow level.

Conclusions

Within the full cohort, the unstable stress-resistance type accounted for 63.95% of cows, the low-resistance type for 15.12%, and the high-resistance type for 20.93%. Wilson intervals quantified uncertainty around these proportions, while inclusion of data from all 86 cows reduced the risk of overinterpreting the smaller low-resistance type. The most adverse combined response occurred in low-resistance cows: cortisol increased by 6.45%, whereas daily milk yield decreased by 4.18 kg or 14.88%; the standardised decline in yield was moderate. In the unstable type, milk yield decreased by 4.62% amid pronounced heterogeneity in the hormonal response. The high-resistance type largely maintained baseline cortisol and milk production.

Milk fat decreased in all three types, with the largest relative reduction occurring in unstable cows, at 6.63%, compared with 2.96% in low-resistance cows and 0.46% in high-resistance cows. Milk protein decreased by 0.46% in low-resistance cows and by 2.26% in unstable cows but increased by 3.13% in high-resistance cows. These changes in milk composition are descriptive and require confirmation using individual paired observations. Overall correlations between post-challenge cortisol and milk yield were statistically inconclusive: their confidence intervals included zero and all two-sided p values exceeded 0.05. Basal cortisol should therefore be used only as an additional marker of vulnerability and supplemented with assessments of behaviour, resource availability, and milk-yield dynamics. Confirmation of these findings requires individual-level analysis using a linear mixed-effects model that accounts for repeated measurements, parity, stage of lactation, and the interaction between time and stress-resistance type, together with external validation in independent dairy herds.

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Conflict of Interest

None.

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Социалдык иерархияга байланышкан стресстин коммерциялык сүт комплексиндеги уйлардын гормондук реактивдүүлүгүнө жана сүт өндүрүмдүүлүгүнө тийгизген таасири

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Аннотация. Уйларды кайра топтоштуруу алардын ортосунда калыптанган социалдык мамилелерди бузат. Убактылуу жыш жайгаштыруу тоют, суу жана эс алуучу жайлар үчүн атаандаштыкты кошумча күчөтөт. Изилдөөнүн максаты стресске туруктуулугунун типтери ар башка болгон уйлардын социалдык иерархияга байланышкан стресске карата гормондук жана өндүрүмдүүлүк реакцияларын коммерциялык сүт комплексинин шарттарында баалоо болгон. Аянты 540 м^2 болгон секцияга кошумча 36 уй киргизилгенге чейин жана андан 12 саат өткөндөн кийин 86 саан уйда кортизол менен адреналиндин концентрациялары өлчөнүп, уйлар базалдык кортизол боюнча классификацияланган жана суткалык сүт саап алуу, сүттөгү май менен белок бааланган. Стресске туруктуулугу төмөн, туруксуз жана жогору типтерге тиешелүүлүгүнө жараша 13 уй (15,12 %), 55 уй (63,95 %) жана 18 уй (20,93 %) кирген. Стресске туруктуулугу төмөн уйларда кортизол 129,86-дан 138,23 нмоль/л-ге чейин жогорулаган, туруксуз типте 72,33төн 68,89 нмоль/л-ге чейин төмөндөгөн, ал эми жогорку туруктуулуктагы уйларда дээрлик өзгөргөн эмес – 47,21 жана 48,03 нмоль/л. Он эки сааттан кийин адреналин баштапкы деңгээлден 35,13 %, 41,00 % жана 14,12 % төмөн болгон. Суткалык сүт саап алуу төмөн туруктуулуктагы уйларда 4,18 кг-га, же 14,88 %-га, туруксуз типте 1,28 кг-га, же 4,62 %-га азайган, ал эми жогорку туруктуулуктагы уйларда 0,39 кг-га, же 1,30%-га көбөйгөн. Сүттөгү май тиешелүүлүгүнө жараша 2,96 %, 6,63 % жана 0,46 % азайган, ал эми белок -0,46 %, -2,26 % жана +3,13 % өзгөргөн. Таасирден кийинки кортизол менен сүт саап алуунун корреляция коэффициенттери 0,33, 0,18 жана 0,45 болгон; бардык 95 % ишеним интервалдары нөлдү камтып, p маанилери 0,05тен жогору болгон. Өндүрүмдүүлүктүн төмөндөө коркунучу стресске туруктуулугу төмөн уйларда эң жогору болгондуктан, аларды багууда минималдуу тынчсыздануу жараткан кайра топтоштуруу ыкмаларын колдонуу жана негизги ресурстар үчүн атаандаштыкты азайтуу зарыл

Негизги сөздөр: үйүрдү кайра топтоштуруу; социалдык атаандаштык; кортизолдун базалдык концентрациясы; адреналин; суткалык сүт саап алуу; жайгаштыруу жыштыгы; жекече реактивдүүлүк

Влияние стресса, связанного с социальной иерархией, на гормональную реактивность и молочную продуктивность коров в условиях промышленного молочного комплекса

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Аннотация. Перегруппировка нарушает сложившиеся социальные взаимоотношения между молочными коровами. Временное увеличение плотности размещения дополнительно усиливает конкуренцию за корм, воду и места для отдыха. Целью исследования являлась оценка гормональных и продуктивных реакций коров с различными типами стрессоустойчивости на стресс, связанный с социальной иерархией, в условиях промышленного молочного комплекса. У 86 лактирующих коров до введения в секцию площадью 540 м^2 дополнительных 36 животных и через 12 часов после него определяли концентрации кортизола и адреналина, классифицировали коров по базальной концентрации кортизола и оценивали среднесуточный удой, содержание жира и белка в молоке. Низкая, нестабильная и высокая стрессоустойчивость установлена соответственно у 13 коров (15,12 %), 55 коров (63,95 %) и 18 коров (20,93 %). У коров с низкой стрессоустойчивостью концентрация кортизола увеличилась со 129,86 до 138,23 нмоль/л, у животных нестабильного типа снизилась с 72,33 до 68,89 нмоль/л, а у высокоустойчивых коров практически не изменилась – 47,21 и 48,03 нмоль/л. Через 12 часов концентрация адреналина была ниже исходной на 35,13 %, 41,00 % и 14,12 % соответственно. Среднесуточный удой у низкоустойчивых коров снизился на 4,18 кг, или 14, 88 %, у коров нестабильного типа – на 1,28 кг, или 4,62 %, а у высокоустойчивых коров увеличился на 0,39 кг, или 1,30 %. Содержание жира снизилось соответственно на 2,96 %, 6,63 % и 0,46 %, а содержание белка изменилось на -0,46 %, -2,26 % и +3,13 %. Коэффициенты корреляции между концентрацией кортизола после воздействия и удоем составили 0,33, 0,18 и 0,45; все 95 % доверительные интервалы включали нулевое значение, а значения p превышали 0,05. Наибольший риск снижения продуктивности установлен у коров с низкой стрессоустойчивостью, поэтому при работе с ними следует применять малотравматичные способы перегруппировки и минимизировать конкуренцию за основные ресурсы

Ключевые слова: органические удобрения; навоз; озимая рожь; плодородие почвы; устойчивое земледелие