Animal Science Papers and Reports vol. 22 (2004) no. 4, 631-636
Institute of Genetics and Animal Breeding, Jastrzębiec, Poland

Sexual behaviour and heart rate in mares during *oestrus* control

Aleksandra Górecka, Małgorzata Golonka, Tadeusz Jezierski

Polish Academy of Sciences Institute of Genetics and Animal Breeding, Jastrzębiec, 05-552 Wólka Kosowska, Poland

(Received September 4, 2004; accepted November 2, 2004)

The aim of this pilot study was to examine whether the expression of the sexual behaviour of mares when subjected to routine *oestrus* control (teasing) during different physiological statuses (*oestrus*, *dioestrus*, pregnancy) is related to emotional reactivity as determined by heart rate (HR).
Fourteen Polish Konik (Polish Primitive Horse) mares were submitted to routine *oestrus* control (teasing) during reproductive season in the year 2002. The sexual behaviour was assessed by behavioural score (BS) expressing the increasing sexual receptivity of the mare. BS was found to be related (P<0.01) with the physiological status, the highest being observed during *oestrus* (6.57 points) as compared to *dioestrus* and pregnancy (3.04 and 2.19 points, respectively).
The HR measured during teasing was found to be associated with physiological status of the mare (P<0.001), the highest occurring in *dioestrus* (76.8 beats/min). In turn, the HR during *oestrus* did not differ from that recorded in pregnant mares (65.4 and 67.2 beats/min, respectively). During *oestrus*, the correlation coefficient between BS and HR was significant (P<0.01), but very low (0.08). In *dioestrus*, the HR was negatively correlated (P<0.01) with BS (r = -0.15). There was no relationship proved between HR and BS during teasing in pregnant mares (r= -0.04, P=0.39). The results show the inconsistency between the results of visual estimation of sexual behaviour and emotional reactivity as determined by the HR. Thus, the same behaviour observed by a human may have, in different situations, different emotional background. It is supposed that this may be one of reasons for diminished expression of sexual behaviour ('silent *oestrus*') in mares.

KEY WORDS: emotional reactivity / heart rate / mares / *oestrus* / Polish Konik / sexual behaviour

Under stable conditions, detection of *oestrus* is based mainly on the observations of the mare's behaviour towards a stallion. During *oestrus*, the behaviour of mares is expressed by raising *attractivity* and *proceptivity* (behaviour or odour encouraging the

stallion) or *receptivity* (behaviour that facilitates mating) – Beach [1976]. The display of *oestrous* signs usually terminates simultaneously with ovulation of the dominant follicle. During following *dioestrus* phase the mare's behaviour towards a stallion changes into non-receptive and often aggressive. Such behaviour continues when the mare becomes pregnant, or changes again into receptive, if there is no pregnancy and successive *oestrus* appears.

The individual emotional sensitivity may play a crucial role in the behavioural displaying the current physiological status. As it has been reported for other species, the emotional reactivity (temperament) affects female sexual behaviour in sheep [Gelez *et al*. 2003] and sows [Pedersen *et al*. 2003]. In the earlier study by Górecka [2000], mares of two breeds (Polish Konik and Thoroughbred), differing markedly in reactivity, differed also in the intensity of the sexual behaviour, i.e. weaker *oestrus* expression was found in Thoroughbred mares, which are known as being more reactive to external stimuli.

In literature available no information was found on the relationship between the emotional reactivity and *oestrus* intensity, although some research on hormones' activation around teasing, natural service and associated events in mares has been conducted [Tischner *et al*. 1996, Nikolakopoulos *et al*. 2000].

The aim of this pilot study was to determine whether sexual behaviour of mares during routine *oestrus* control (teasing) in different physiological statuses (*oestrus*, *dioestrus*, pregnancy) is related to emotional reactivity or sensitivity. Several authors report that heart rate correlates with reactivity during various emotional challenges applied in behavioural tests in horses [McCann *et al*. 1988, Jezierski *et al*. 1999, 2000, Visser *et al*. 2002]. Thus, in this study, the reactivity of mares was evaluated based on changes in the heart rate.

Material and methods

Fourteen Polish Konik mares were submitted to routine *oestrus* control (teasing) during the reproductive season 2002. The mares were teased during *oestrus*, *dioestrus* and early pregnancy. Each mare was observed every day during *oestrus*, every other day during *dioestrus* and then at least three times until the pregnancy was ultrasonically diagnosed.

The behaviour of mares was videotaped and analysed thereafter using behavioural score (BS) shown on the next page. The heart rate (HR) monitor (Sport Tester, POLAR, Finland) was attached to the mare's chest before teasing procedure. After one min, the mare was led out of the stable into the teasing paddock, located nearby the stable. After the teasing procedure, the mare was led back to the stable and HR monitor was detached after one min that the mare spent in her box.

The significance of differences in BS and HR between the three physiological statuses monitored during teasing (physiological status effect) was estimated using

mixed effects' model with random mare effect. The relationship between BS and HR was analysed by Pearson's correlations. All analyses were made using SAS System statistical package.

Behavioural score (BS) used is presented below.

Score (points)	Description
1	non-receptive behaviour (tail switching, moving around, squealing, holding ears back, attempts to kick); mare attacks or kicks the teasing stallion
2	non-receptive behaviour (tail switching, moving around, squealing, holding ears back, attempts to kick); no attack towards the stallion
3	non-receptive behaviour (tail switching, squealing, holding ears back, attempts to kick); mare stands still
4	mare stands still indifferently; neither receptive nor non-receptive behaviour
5	mare shows *oestrus* behaviour: stands still, raises tail or winks, accompanied by some non-receptive behaviour (tail switching, squealing, holding ears back, attempts to kick)
6	mare shows *oestrus* behaviour: stands still, raises tail or winks; no non-receptive behaviours
7	mare shows full *oestrus* behaviour: stands still, raises tail, winks, pass fluids and lowers pelvis (postures), accompanied by some non-receptive behaviour (tail switching, squealing, holding ears back, attempts to kick)
8	mare shows full *oestrus* behaviour: stands still, raises tail, winks, pass fluids and lowers pelvis (postures); no non-receptive behaviours

Results and discussion

As expected, the sexual behaviour as assessed by BS was affected ($P<0.01$) by the physiological status (Tab. 1). The highest BS was observed for teasing during *oestrus* (6.57). Although *dioestrus* and pregnancy are typically characterised by non-receptive behaviour, the defensive behaviour was stronger during the early pregnancy than in the *dioestrus* phase (BS = 2.19 and 3.04, respectively).

Interestingly, no such relationship was observed in the HR profile (Tab. 1). Although the effect of the physiological status was found significant ($P<0.001$), the HR during teasing in *oestrus* did not differ from HR in pregnancy (65.4 and 67.2 beats/min, respectively). The highest HR appeared during *dioestrus* (76.8 beats/min).

HR was moderately correlated with BS (figures not tabulated). During *oestrus*, the correlation coefficient, although significant, was very low ($r = 0.08$). In *dioestrus*, the HR was negatively correlated with BS ($r = -0.15$, $P<0.01$). No relationship was found between HR and BS during teasing of pregnant mares ($r = -0.04$, $P=0.39$).

Table 1. Heart rate (HR) and sexual behaviour as determined by behavioural score (BS) in Konik mares during teasing as related to the physiological status (*oestrus*, *dioestrus*, pregnancy)

Physiological status	BS		HR	
	mean	SEM	mean	SEM
Oestrus	6.57^{A}	0.17	65.4^{A}	2.63
Dioestrus	3.04^{B}	0.17	76.8^{B}	2.69
Pregnancy	2.19^{C}	0.18	67.2^{A}	2.85

^{ABC}Within columns means bearing different superscripts differ significantly at $P<0.01$.

The results of this pilot study showed that manifestations of the emotional reactivity in mares towards teasing stallion depended on the mares' physiological status. The observed receptive and non-receptive behaviours could have been clearly differentiated and classified by a human observer. However, the emotional status of the mares not always followed visual observations. The correlation between the HR and BS in *dioestrus*, indicates higher emotional activation towards defensive behaviour as compared to other physiological statuses, especially pregnancy. Interestingly, during pregnancy, mares showed more pronounced non-receptive behaviour, however without strong emotional component. The reason for a strong visual manifestations of non-receptivity during pregnancy is obvious. A pregnant mare shows a 'fight behaviour', because mating may cause the abortion as the result of uterine contractions provoked by the prostaglandins contained in stallion's semen. There is no such danger during *dioestrus*, but the emotional agitation was found significantly higher than during *oestrus* or pregnancy. During the reproductive season under natural conditions, the stallion is sexually active, controlling continuously the mares for *oestrus*, independently of their physiological status and the mare in *dioestrus* can simply move away ('flight behaviour'), without any aggressive reactions against the stallion, signalling non-receptivity [McDonnell 2000]. During 'in-hand' breeding, the mare is not allowed to move freely, and when devoid of the possibility to move away may exhibit the more aggressive reaction. This may have a significant importance for the welfare of housed horses, when applying constraining methods and, in the case of sensitive individuals, may suppress the expression of full receptivity. Moreover, submitting a more sensitive mare to stressful situation during *oestrus* control may be a potential factor of subfertility [Dobson and Smith 2000]. However, further study, comparing different breeds and breeding or housing systems is necessary.

The most important message from results presented here is the existing of inconsistency between results of visual estimation of sexual behaviour (BS) and emotional reactivity (HR). Thus, the same behaviour observed by a human may have, in different

situations, different emotional background. Hypothetically, this may be one of reasons for diminished expression of sexual behaviour ('silent oestrus') in horses.

REFERENCES

1. BEACH F.A.,1976 – Sexual attractivity, proceptivity and receptivity in female mammals. ***Hormones and Behaviour*** 7 (1), 105-138.
2. DOBSON H., SMITH R.F., 2000 – What is stress, and how does it affect reproduction? ***Animal Reproduction Science*** 60-61, 743-752.
3. GELEZ H., LINDSAY D.R., BLACHE D., MARTIN G.B., FABRE-NYS C., 2003 – Temperament and sexual experience affect female sexual behaviour in sheep. ***Applied Animal Behaviour Science*** 84, 1, 81-87.
4. GÓRECKA A., 2000 – Comparison of sexual behaviour in primitive konik and highly selected thoroughbred mares. ***Advances in Ethology*** 35, 34.
5. JEZIERSKI T., JAWORSKI Z., GÓRECKA A., 1999 – Effects of handling on behaviour and heart rate in konik horses. Comparison of stable and forest reared youngstock. ***Applied Animal Behaviour Science*** 63, 1-11.
6. JEZIERSKI T., GÓRECKA A., 2000 – Changes in the horses heart rate during different levels of social isolation. ***Animal Science Papers and Reports*** 18 (1), 33-34.
7. MCCANN J.S., HEIRD J.C., BELL R.W., LUTHERER L.O., 1988 – Normal and more highly reactive horses. I. Heart rate, respiration rate and behavioural observation. ***Applied Animal Behaviour Science*** 19, 201-214.
8. MCDONNELL S., 2000 – Reproductive behaviour of stallions and mares: comparison of free-running and domestic in hand breeding. ***Animal Reproduction Science*** 60-61, 211-219.
9. NIKOLAKOPOULOS E., KINDHAL H., GILBERT C.L., GOODE J., WATSON E.D., 2000 – Release of oxytocin and prostaglandin $F_{2\alpha}$ around teasing, natural service and associated events in the mare. ***Animal Reproduction Science*** 63, 89-99.
10. PEDERSEN L.J., DAMM B.I., KONGSTED A.G., 2003 – The influence of adverse or gentle handling procedures on sexual behaviour in fearful and confident sows. ***Applied Animal Behaviour Science*** 83, 4, 277-290.
11. TISCHNER M., NIEZGODA J., TISCHNER M., 1996 – Studies on the effect of manual massage of the ovaries on the reproductive activity of the mare. ***Theriogenology*** 45, 1457 – 1464.
12. VISSER E.K., VAN REENEN C.G., VAN DER WERF J.T.N., SCHILDER M.B.H., KNAAP J.H., BARNEVELD A., BLOKHUIS H.J., 2002 – Heart rate and heart rate variability during a novel object test and handling test in young horses. ***Physiology and Behaviour*** 76, 289-296.

Aleksandra Górecka, Małgorzata Golonka, Tadeusz Jezierski

Zachowanie płciowe a tętno klaczy podczas testowania na obecność rui

Streszczenie

Celem podjętego badania pilotowego było stwierdzenie, czy zachowanie płciowe podczas testowania na obecność rui ("próbowania") klaczy znajdujących w różnym stanie fizjologicznym – ruja, okres

międzyrujowy (*dioestrus*), ciąża – wiąże się z reakcjami emocjonalnymi, ocenianymi na podstawie pomiaru tętna (*heart rate* – HR). Czternaście klaczy rasy konik polski poddano rutynowej kontroli na obecność rui w sezonie rozrodczym roku 2002. Zachowanie płciowe klaczy oceniane za pomocą współczynnika zachowań płciowych (*behavioural score* – BS), wyrażającego w skali punktowej rosnącą akceptację ogiera, było zależne ($P<0,01$) od stanu fizjologicznego, w jakim znajdowała się klacz. Najwyższy współczynnik BS wystąpił przy próbowaniu w czasie rui – 6,57 punktów – podczas gdy w okresie międzyrujowym i ciąży wyniósł odpowiednio 3,04 i 2,19 punktów. Stan fizjologiczny istotnie wpływał na wysokość tętna podczas próby ($P<0,01$). Najwyższe tętno występowało przy próbowaniu w okresie międzyrujowym (76,8 uderzeń/min). Tętno klaczy mierzone podczas próby dokonywanej w rui nie różniło się od tętna klaczy źrebnych (odpowiednio 65,4 i 67,2 uderzeń/min). Podczas rui wystąpiła istotna, lecz bardzo niska korelacja między BS a HR ($r = 0,08$, $P<0,01$). Podczas próby dokonywanej w okresie międzyrujowym tętno (HR) było umiarkowanie związane ze spadkiem współczynnika BS ($r = -0,15$, $P<0,01$). Z kolei podczas prób dokonywanych w okresie ciąży, tętno nie wykazywało istotnej korelacji z BS ($r = 0,04$, $P = 0,39$).

Uzyskane wyniki świadczą o rozbieżności między oceną wizualną zachowania płciowego klaczy a ich reaktywnością emocjonalną, wyrażającą się poziomem tętna. W związku z tym, dane zachowanie płciowe klaczy obserwowane i oceniane przez człowieka, może mieć w różnych sytuacjach różne podłoże emocjonalne. Rozbieżność ta jest – być może – jedną z przyczyn niepełnego wyrażania zachowania płciowego i może prowadzić do występowania tzw. cichych rui u klaczy.