

carcass fat weight was most significantly correlated with leg muscles: *m. tibialis anterior* ( $r = 0.711$ ), *m. gastrocnemius lateralis* ( $r = 0.630$ ) and *m. semitendinosus* ( $r = 0.611$ ).

**Summary.** The results of this study indicate that carcass lean content can be evaluated based on the weight of the right and left breast muscles, and *m. gastrocnemius medialis* ( $r > 0.6$ ) in both genders, and on the weight of *m. semitendinosus* ( $r = 0.79$ ) and *m. peroneus superficialis* ( $r = 0.65$ ) in females. Estimates of the weight of skin with subcutaneous fat in the carcasses of broiler chickens based on the weight of individual muscles could be inaccurate due to the low values of correlation coefficients. The highest correlation was found between breast muscle weight and the weight of skin with subcutaneous fat ( $r > 0.6$ ). The weight of *m. gastrocnemius medialis* was also a reliable indicator of carcass fatness in male chickens ( $r = 0.67$ ).

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#### THE INFLUENCE OF EARLY HUMAN-ANIMAL INTERACTIONS ON THE LATER BEHAVIOR OF CALVES

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**Keywords:** calves, behavior, human-animal interactions, handling

**Abstract.** Relations between people and animals might have a significant impact on behavior, productivity as well as their welfare. Positive relations of a human

*being with young cattle might translate into easier, more effective and safer handling of such animals at later age.*

*The aim of this work was an analysis of the impact of an early human-calf contact on calves' later behavior.*

*Studies were conducted on 21 calves – heifers, which after separation from dams had a positive contact with humans: after birth, after 8 hours and through five subsequent days (petting and gentle patting of the whole body). At the age of 4 weeks their response to a contact with human being was examined again.*

*The undertaken own research showed that calves from the experimental groups, which have had a positive contact with humans before watering were calmer during their first watering with colostrum, in comparison to the control group. What is more, after second positive contact with a human being the majority of calves from experimental groups drank the colostrum independently during the second feeding.*

*After four weeks calves from experimental groups which had a positive contact in their first day of life and through five subsequent days responded identically to the contact with a human being. The majority of calves were calm but did not approach humans and at the moment of a direct contact – did not withdraw. On the other hand, calves from the control group were anxious and none of them approached humans. At the moment of direct contact those calves withdrew from human contact.*

*In summary it can be assumed that early contact of a human being with a calf might have an impact on its later behavior.*

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**Introduction.** Relations between humans and animals might have a significant impact on behavior, productivity and their welfare (Bielczyk 2010, Hemsworth et al. 2000, Krohn et al. 2001, Raussi 2003, Waiblinger et al. 2006). Positive interactions of humans with young cattle might translate into easier, more effective and safer handling of those cows at older age. This problem is even more important because the cow's keeping system changes from tethered to free-standing (Jago et al. 1999, Krohn et al. 2003, Wójcik et al. 2014). It causes the animals which are deprived of daily contact with humans during feeding and milking to become distrustful of men. In free standing cattle keeping system it is difficult to approach cows to assess their health state, give drugs, determine if the cow is with calf or to correct its hooves.

The time period during which the animal contact with men translates into positive relations and lowering of fear of men is different in individual species. In pigs this period falls within the first 3 weeks after birth, whereas in horses within the first 42 days (Bielczyk, 2010, Miller, 2007). It clearly shows the existence of a critical period (Lansade et al. 2005). Research undertaken by Markowitz et al., (1998) points out that in case of sheep it only takes 40 minutes of contact with the human during the first 3 days after birth for them to express significantly lower distrust to men in comparison to control

animals. Fraser and Broom (1990) suggest that in cattle the optimal time for development of social interactions with humans is the first 4 to 6 days after birth. Jago et al. (1999) basing on their research show that the first two days after birth of a calf may be important for the development of a strong and lasting motivation for interaction with men. Research conducted by Krohn et al. (2001, 2003) indicate that contact and feeding of calves by humans in the first 4 days after birth both increase the motivation of animals to approach men in comparison to calves which had a minimal contact with them.

The aim of this study was to determine the impact of an early contact of calves with humans on their later behavior.

**Materials and methods.** The research was conducted in the period of 3 months, from July to September 2015. Holstein-friesian cows were kept on the farm in an amount of 2250 pieces. Cows were kept in the free standing barn on a shallow bedding. For the time of parturition cows were transferred to the calving pen. Calves were separated from their dams after calving and transported by a trolley to the calves' barn, where they were weighed and placed in single pens lined with straw. Then they were watered with 4 liters of colostrum with the use of a probe. Then watering was performed twice a day and calves received milk from teat-buckets. During the stay in single pens such actions as: daily filling-up with straw, ear piercing with ear clips and health prevention were performed. At the age of 10-14 days calves were transported to group pens. They were still fed with milk twice a day, however additionally they had a constant access to hay as well as concentrated feed.

Studies were conducted on 21 calves – heifers. They were divided into 3 groups: control group and two experimental groups (Table 1). Control group of calves (G-C) was treated in the usual way, for this farm.

Table 1 – Layout of the study

Specification	Contact after birth	Contact after 8 hours	Contact through 5 subsequent days	Contact after 4 weeks
Control group (G-C)	-	-	-	+
1st experimental group (G-I)	+	+	-	+
2nd experimental group (G-II)	+	+	+	+

In the first and second experimental groups (G-I and G-II) calves had their first positive contact with a human being after transportation to calves' barn and weighing. It consisted of petting and gentle patting of the whole body. Additionally ears on the outside as well as inside, nostrils and udders were touched. All of these actions were performed while the calf was lying down and was not allowed to stand up. Whole contact lasted 40 minutes.



Pic. 1 – Touch and nose massage (by A Gruba)



Pic. 2. Touch and body massage after 8 hours of birth (by A Gruba)



Pic. 3 – Checking the calf's response to humans after 4 weeks, touch whole body (by A. Gruba)

The second positive contact with the human being calves had after 8 hours through 15-20 minutes. Contact looked the same as the one mentioned above, the only difference being the fact that calves were in the standing position. After this phase the first experimental group did not have any additional contact with men, beside contacts due to daily activities performed by workers. The second experimental group (G-II) had additional contact with men for 5 subsequent days. Every day, single time for 15 minutes calves were petted and patted on the whole body, legs were lifted and petted also.

The observations of behavior of calves in each group while transporting to calves' barn, weighing as well as first and second watering were performed. Then reactions of calves during interactions with humans (calm/temporarily anxious/anxious). At the age of 4 weeks, when calves stayed in group pens, their response to contact with men during petting and patting (calm/temporarily anxious/anxious) was examined. After entrance to the pen it was also observed whether calves did or did not approach men and did or did not withdraw from physical contact.

Collected results were compiled into tables and charts.

**Results and their discussion.** The first week of life of calves is the best period to establish interaction between a man and an animal. Especially feeding of calves in the first two days after birth may be of huge importance to later relations with the animal (Jago et al. 1999, Krohn 2001, Lensink et al. 2001, Raussi 2003). That is why it is important from the beginning to assure that the first contact is made in such way to establish positive relations.

First observations of calves in all groups concerned behavior during transportation to calves' barn and during weighing (Fig. 1 and 2). In control group and second experimental group, during transportation five calves were calmly lying down in the trolley, whereas other ones clearly wanted to stand up. In the first group only three calves were calm, whereas 4 other wanted to stand up several times. After birth calves stand up after several dozen minutes so their need to change position during transportation is obvious. Calf's response during transportation may be connected to the course of parturition as well. Calves born during easy parturition stand up earlier than those born during parturitions with difficulties. Calf activity might depend on housing conditions as well. Such time is shorter in calves which stayed with their dam after birth in comparison to the detached ones (Neja 2013).

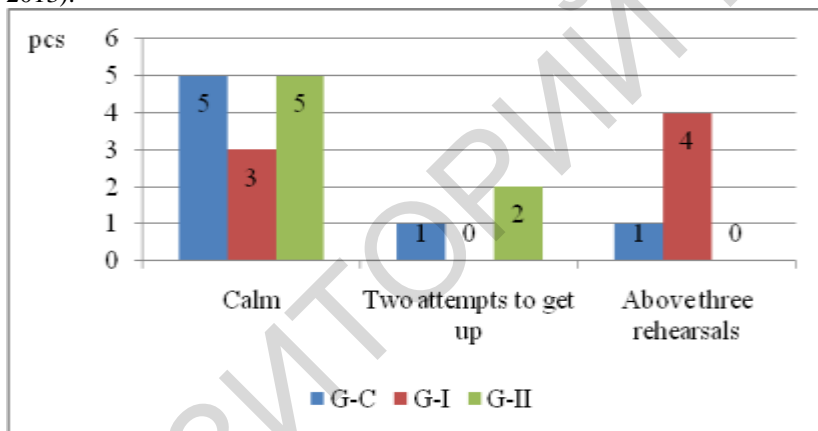


Fig.1 – Behavior of the calves during transport with the cart to the calf

After transportation to calves' barn all of the animals were weighed on the stationary weight. Undertaken observations during weighing indicate that such actions cause anxiety in calves. Nearly half of the calves in the control group and the first experimental group as well were anxious during weighing (Fig. 2). Calmest were calves of the second group, being such during transportation as well.

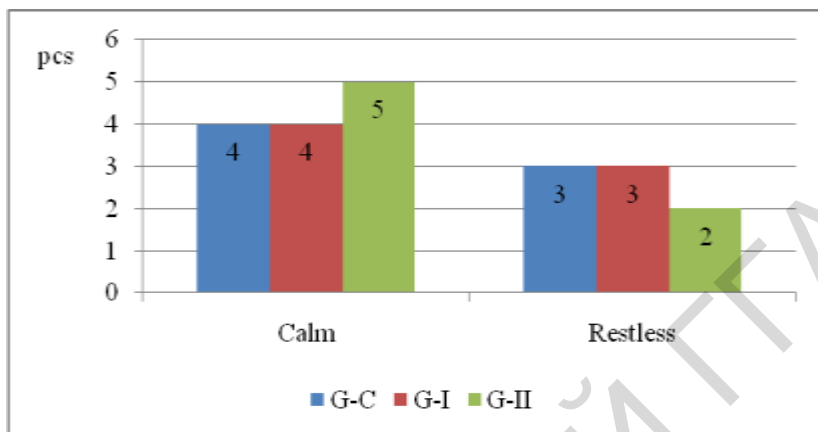


Fig. 2 – Behavior of the calves when weighing

After transportation to calves' barn and weighing calves of the control group were watered with colostrum for the first time, whereas calves from the first (G-I) and second (G-II) group had their first positive contact with a man. Licking of the calf by its dam after birth is performed in order to dry the animal and stimulate blood circulation, however it additionally influences the establishment of a bond between them (Reinholz-Trojan 2007). At the same time the first stimuli received during the licking process are received as pleasant. Thus touching is good for establishing positive interactions between a man and an animal. That is why the first positive contact relied on petting and gentle patting of the whole body, also ears on the outside and inside, nostrils and udder were all touched (Pic. 1). All of the actions were performed while the calf was lying and it was not allowed to stand up during this procedure. Whole contact lasted 40 minutes.

In both research groups during the first contact with human nine calves were calm (in group I – 4 pieces, in group II – 5 pieces). In group I two calves were anxious during the first moments of contact. One calf was however anxious until the end of procedure in this group, whereas in the second group there were two anxious calves (Table 2). Calves which were anxious attempted to stand up many times, whereas other animals were lying calmly and did not attempt position change.

The second positive contact with humans calves had after 8 hours after birth and before second colostrum watering. Contact looked the same as the first time, the only difference being standing position of calves (Fig. 2). During the second positive contact ten calves were calm (Fig. 2). The remaining calves were restless. Calves which were acting calmly during the first contact, stayed the same throughout the second one.

Table 2 – Behavior of calves during positive relationships with human (pcs)

Specification		1st experimental group (G-I)	2nd experimental group (G-II)
Contact after birth	Calm	4	5
	Temporarily restless	2	0
	Restless	1	2
Contact after 8 hours	Calm	5	5
	Temporarily restless	0	0
	Restless	2	2
Contact through 5 subsequent days	Calm	-	5
	Temporarily restless	-	1
	Restless	-	1

Next activity which was conducted on calves by humans was watering with colostrum. Calves which were under research were watered with the use of a probe. This way of watering not only causes them fear and pain but also does not allow to establish a positive human-animal relation. First watering is very important for calves as it meets their physiological need of food intake. It is also essential in establishment of a bond with dam and gives calf a sense of security. The first contact of the calf with dam is a positive experience which may be used in establishing of bond and relation with a human being. Jago et al. (1999) in their research observed that even short positive human-animal contact, during feeding in the first two weeks of life might minimize the negative response to people.

During first watering of calves with colostrum (Table 3) the most anxious and breaking out animals were observed in the control group (5 pieces). Calves which were calm at first, at the end of watering showed signs of strong anxiety. During second watering 5 calves from this group did not want to drink colostrum despite the fact that watering was performed with the use of a teat-bucket (Fig. 3). Two remaining calves drank only a small amount of colostrum during second watering. It was also observed that all of the animals defecated meconium properly, without any problems. However such activity caused anxiety in 3 calves, whereas four remained calm.

During the first watering with colostrum of calves of the first group one calf was anxious, two calves were also anxious and additionally attempted to break out several times (Table 3). Remaining four calves were calm at first, however during watering they became increasingly anxious and tried to break out. Meconium defecation in all of the calves was proper, four calves were anxious during this process, whereas three other remained calm.

The lowest amount of calves which were anxious and trying to break out during the first watering occurred in the second experimental group (Table 3). Similar to the first group four calves were calm, however at the end



of watering they showed signs of anxiety and tried to break out. Only one calf did not show any sign of anxiety throughout the activity. During second watering (Fig. 3) only one calf did not drink, five calves were drinking only the smaller amount, whereas one calf was drinking normally. It was also observed that meconium defecation in each of the animals was good, in four calves it caused anxiety, whereas the rest remained calm.

Table 3 – Behavior of calves during the first watering colostrum (pcs)

Specification	Control group (G-C)	1st experimental group (G-I)	2nd experimental group (G-II)
Restless	1	1	1
Restless, pulled awal	4	2	1
Moderately calm, but restless at the end of the watering	1	1	1
Calm, but restless at the end of watering	1	3	3
Calm	0	0	1

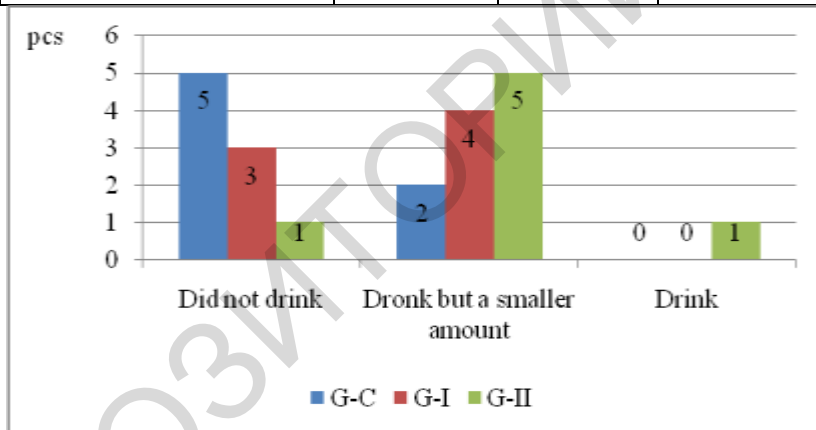


Fig. 3 – Behavior of the calves during the second drinking of colostrum

Undertaken own research showed that calves from the experimental groups, which had a positive contact with humans before watering, were calmer during first watering with colostrum in comparison to the control group. What is more, after the second contact with men the majority of calves from the experimental group were drinking colostrum by themselves throughout the second watering.

In the second experimental group calves were under an additional contact with humans for the next 5 days. Every day, single time for about 15 minutes calves were petted and patted on the whole body, legs were lifted and petted also (Fig. 3). During these contact five calves in average were

calm, one calf was temporarily anxious and one was anxious (Table 2). It is needed to add that not always the same calves were calm throughout daily activities.

After one month the response of calves to human contact was examined. In the control group it was noticed that calves reacted anxiously to humans, from seven calves only two calmed down after a short while (Fig. 4). None of the animals approached humans freely, whereas four calves withdrew after contact and three stood still (Fig. 5).

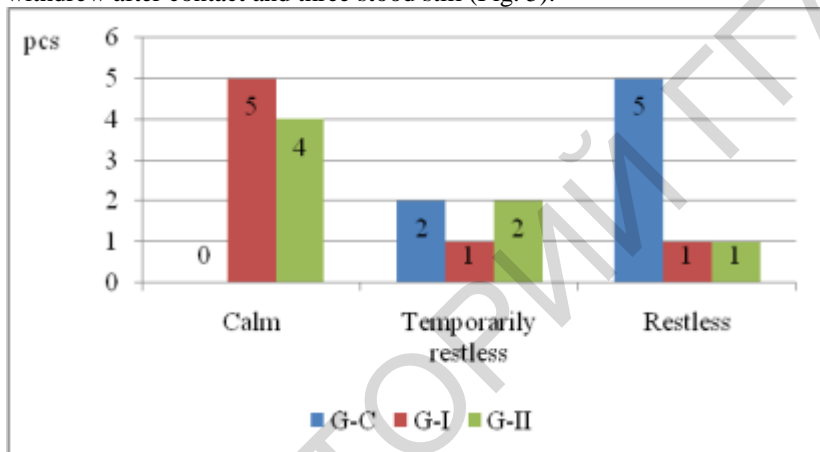


Fig. 4 – Behavior of calves during contact with humans after four weeks

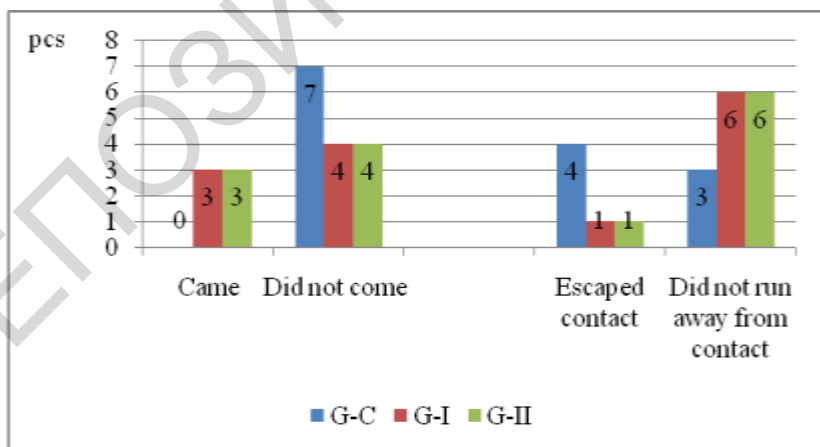


Fig. 5 – Reaction of the calves to contact and desire to approach the human

In the experimental groups the majority of calves reacted calmly (G-I – 5 pieces; G-II – 4 pieces) when seeing humans. In the first group, in which the positive contact had occurred twice on the first day after birth, there was one calf which was anxious and one which calmed down after a short while (Fig. 4). In the second group, where contacts with humans occurred for the next 5 days after birth, temporarily anxious were two calves, whereas anxious was one piece.

Although, the majority of calves in the experimental groups were calm they approached humans unwillingly (Fig. 5). Only three calves in each group that approached men freely were observed. Calves reacted definitely better to the contact with men as only one piece in every group withdrew from the touch.

There have been multiple studies undertaken in recent years to examine the meaning of an early contact for calves, their behavior and productivity (Bovin et al. 2009, Hemsworth et al. 2000, Jago et al. 1999, Khron et al. 2001, Lensink et al. 2000, 2001, 2003, Raussi 2003, Schütz et al. 2012). Many studies show that proper handling of animals [physical contact, touch and manipulations – handling] may have an impact on behavior towards people. The character of such contact has an influence on animal behavior: positive, neutral or negative as well as time in which they experience this contact (Hemsworth et al. 2000, Jago et al. 1999, Khron et al. 2003). Additionally, research showed that either the fact of keeping calves with dams, when they were separated and whether they were kept separate or in groups also have an impact on future behavior towards humans (Hemsworth et al. 2000, Jago et al. 1999, Khron et al. 2001, Lensink et al. 2001).

In own research it was determined that after four weeks calves from the experimental groups, which had a positive contact in their first day of life and in the next 5 days, reacted to the contact in the same way. The majority of calves were calm but did not approach humans and at the time of direct contact - did not run away from it. Calves from the control group, however, were anxious and none of them approached humans. At the time of direct contact such animals ran away from the contact most often.

**Conclusions.** Early contact with people lowers the fear towards them in case of poultry, pigs, rabbits, foxes, dogs, sheep and goats. In case of cattle, in addition to lowering fear of men, it lowers aggression level towards men and stress of new situations (Bielczyk 2010). Thanks to free standing cattle keeping, their behavioral needs are fulfilled, such as social contacts or reproductive behavior. The freedom of movement simplifies the establishment of hierarchy, thus enabling cows to know their place and minimizes the number of fights. The animals have a higher sense of security and thanks to that stress is lowered (Wójcik et al. 2014). However, modern cattle breed-

ing methods which focus on an increased automatization and increased number of animals at the same time restrict breeder's direct contact with animals and establishment of positive relations with them (Krohn et al. 2001). It is often possible to make working with them easier by making small changes in their handling during their first period of life.

Undertaken own studies showed that calves from the experimental groups which had a positive contact with humans were calmer during the first watering with colostrum in comparison to the control group. Additionally, after the second positive contact with men majority of animals from experimental groups drank colostrum by themselves during the second watering.

After four weeks calves from the experimental groups, which had a positive contact with humans in their first day of life and in the next 5 days reacted in the same way. Majority of calves were calm but they did not approach men and at the moment of direct contact – did not withdraw. On the other hand calves from the control group were anxious and none of them approached men. At the moment of direct contact those calves mostly withdrew.

In summary it can be stated that the early human-calf contact may have an impact on calves' later behavior.

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