ACTA UNIVERSITATIS AGRICULTURAE ET SILVICULTURAE MENDELIANAE BRUNENSIS

Volume 63 12 Number 1, 2015
http://dx.doi.org/10.11118/actaun201563010095

EFFECT OF HOUSING OF LACTATING SOWS ON THEIR REPRODUCTIVE PERFORMANCE AND LOSSES OF PIGLETS FROM BIRTH TO WEANING

Pavel Nevrkla[1], Zdeněk Hadaš[1]

[1] Department of Animal Breeding, Faculty of Agronomy, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic

Abstract

NEVRKLA PAVEL, HADAŠ ZDENĚK. 2015. Effect of Housing of Lactating Sows on Their Reproductive Performance and Losses of Piglets From Birth to Weaning. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis,* 63(1): 95–100.

The objective of this study was to evaluate selected reproductive parametres of sows stabled in farrowing houses with different technologies and losses of piglets from birth to weaning. Each variant involved 40 sows and 40 litters and the aim was to demonstrate the effect of the housing on losses of piglets. One variant (housing A) was modern while the other (housing B) was older. The total number of piglets reached in housing A was 13.18 ± 1.85 against 13.03 ± 1.91 in housing B. The values of live-born piglets reached 11.50 ± 1.36 in housing A against 11.36 ± 1.46 in housing B. The number of stillborn piglets found in housing A was 1.68 ± 1.49 and in housing B 1.65 ± 1.17. The differences found between the groups in the total number of piglets and the number of live-born and stillborn piglets are not statistically significant. The number of reared piglets was 10.03 ± 1.33 in housing A versus 8.78 ± 1.56 in housing B. In group of sows in farrowing house A (housing A) the recorded loss of piglets in pieces was 1.48 ± 1.04 against 2.60 ± 1.63 in housing B. In percentage the loss of piglets in housing A reached 12.56 ± 8.50 versus 22.29 ± 13.46 in housing B. Statistical analysis of the numbers of reared piglets and losses of piglets proved highly statistically signifficant differences ($P \leq 0.001$).

Keywords: housing, farrowing house, reproduction, losses

INTRODUCTION

The prosperity of sow rearing and production of piglets is influenced by many factors and the new technologies definitely belong to them (Horký, 2014). It can be said that modern technologies enable to exploit maximally the actual genetic potential of sows for several reasons. An optimum use of sow's production potential and the maintenance of its good health condition are surely in the foreground (Horký *et al*., 2012; Horký *et al*., 2013). Modern technologies should not only enable savings of energy, feed and labour, but also comply with natural requirements of animals. In this process, elimination of negative effects on the environment and a marked reduction of labour consumption play an important role (Rodríguez *et al*., 2012).

Individual crates for pregnant/delivering and lactating sows represent the most popular housing system. Andersen *et al*. (2005) mentioned that the adjustable length of crates reduced the risk of overlaying. According to Oliviero *et al*. (2008), the main reason for the use of crates was an effort to reduce losses of piglets due to overlaying.

To protect piglets, it is necessary to create a certain restricted space with local heating (i.e. nest). In principle, this can be solved in two different ways, by means of heated floor (using electric heating or hot-water tubes) and/or by air heating (using infrared radiators or infrared lamps). Although the installation of floor heating is more expensive, it is better from the physiological (and also operational) point of view because it protects sensitive abdominal organs of piglets (Špinka and

Illmannová, 1995). According to Weary *et al.* (1996), the localisation of heat source is very important because it attracts piglets to rest. The heated nest should be localised outside of sow's reach but not too much because piglets want to be near their mother during the first hours of their life.

Regarding the fact that the Czech Republic is now a member country of EU, it should be said that Czech pig farmers are under a strong pressure from the side of their foreign competitors (Nejedlý, 1999). As mentioned by Rodríguez *et al.* (2012), the continuously stricter and stricter EU regulations concerning welfare of sows make production of piglets more and more complicated. The aforementioned trends indicate that, as far as the welfare of pregnant sows is concerned, the future development will be oriented to new technologies and development of new housing systems for pregnant and delivering sows (Damm *et al.*, 2006).

The objective of this study was to evaluate selected reproductive performance of sows stabled in farrowing houses with different technologies and losses of piglets from birth to weaning.

MATERIAL AND METHODS

The experiment involved 80 hybrid sows from the 1st to the 5th litter (Czech Large White x Czech Landrace) housed in farrowing houses with two different types of housing. Each variant involved 40 sows and 40 litters and the aim was to demonstrate the effect of the housing on losses of piglets. One variant (housing A) was modern while the other (housing B) was older. The piglets were weaned at the age of 28 days. All sows received the same feed mixture and feeding rations were given individually according to the performance of animals.

Housing A: Barriers of these parturition pens were made of plastic material. The floor of the pen was made either of concrete (in the front part) or of plastic grids (in the rear). Crates could be opened from the side. Their rear parts were telescopic and could be adjusted to the required length of sow's body. In this type of crates, the laying sow is partly fixed by side barriers (metal arcs) that reach to the space where the sow is lying; this enables only slow laying down so that piglets have enough time to escape and to protect themselves. The floor of the nests for piglets is heated and the infralamp is mounted on a plastic plate that partly overlaps the barriers of the nest.

Housing B: Barriers of farrowing pens were made of wood and the floor of concrete (with some straw as litter). Crates could be opened and also adjusted to the length of sow's body. Crates were not equipped with internal side barriers preventing the overlaying of piglets. An optimum temperature for piglets was assured by heated pads placed on the floor.

In both farrowing houses, there was a positive-pressure ventilation: incoming air was supplied from ventilation slots situated below the ceiling and air outlet was solved by fans installed in outer walls.

In both groups of gilts (housing A, B) phenotypic levels of selected reproductive parametres were observed, namely the total number of born piglets, the number of live-born piglets, the number of stillborn piglets, the number of reared piglets and the number of piglets lost from birth to weaning.

The obtained reproductive paramteres and the losses of piglets in the housing A were compared to the parametres obtained for housing B and basic statistical characteristics for differences in evaluated parametres between the groups of sows were analyzed, namely mean, standard deviation and conclusiveness based on the t-test. The symbol *** stands for $P \leq 0.001$, ** stands for $P \leq 0.01$, * stands for $P \leq 0.05$ a NS stands for $P \geq 0.05$. The statistical evaluation was done using software STATISTICA version 10.0 and Microsoft Excel 2010.

RESULTS AND DISCUSSION

Tab. I presents total numbers of piglets, numbers of live-born, stillborn and reared piglets per litter from sows stabled in different types of farrowing houses. The total number of born piglets from the sows in farrowing house marked as housing A reached 13.18 ± 1.85 against 13.03 ± 1.91 from the sows in housing B. The difference between the groups of sows was not statistically significant. Nguyen *et al.* (2011) state that the litter size at birth is influenced by many factors. By examination of performance of five hundred hybrid sows they found 12.3 piglets born per litter. According to Wolf *et al.* (2008), the aim of the present genotypes of sows is to give birth to the highest possible number of viable piglets. Their experiment showed 13.70 piglets born per litter.

The values of live born piglets were 11.50 ± 1.36 in housing A versus 11.36 ± 1.46 in housing B. The differences between the groups are not statistically significant.

Gu *et al.* (2011) in their evaluation of farrowing pens mentioned 11.2 live-born piglets; this corresponded with number 11.0 published by Kilbride *et al.* (2012). A little lower numbers of live-born piglets were published by Knap and Hájek (1970) who in their evaluation of different housing technologies recorded 9.79 live-born piglets. This value corresponded with number 9.70 published by (Arango *et al.*, 2006).

The number of stillborn piglets found in the group of sows in farrowing house A (housing A) was 1.68 ± 1.49, on the contrary, in the group of sows in the other type of farrowing house (housing B) it was 1.65 ± 1.17. No statistically significant difference was found between the evaluated groups. Schneider *et al.* (2011) point out that the number of stillborn piglets is determined by the size of the litter, which also influences parturition lenght. Longer parturition means higher number of stillborn piglets. Vanderhaeghe *et al.* (2010) found 2.02 ± 1.61

stillbirths per litter with 14.70 ± 3.19 all born piglets. Similar results were also demonstrated by Arango *et al.* (2006) who observed 2.10 stillbirths.

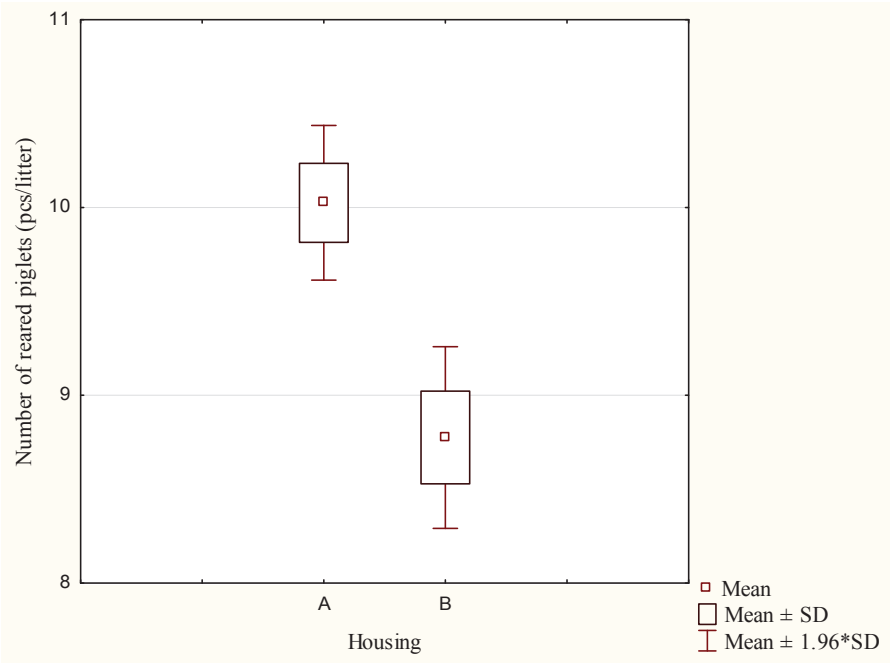
The number of reared piglets is considered the most important effect of breednig sows. The sows in farrowing house marked as housing A reared 10.03 ± 1.33 piglets against the sows in housing B with 8.78 ± 1.56 reared piglets (Fig. 1). The difference between the housing types was 1.25 piece of piglets in favor of more modern type of housing (housing A), which means a highly statistically signifficant difference ($P \leq 0.001$). According to Vanderhaeghe *et al.* (2010), the number of weaned piglets is the most important parameter of sow's performance. Knap and Hájek (1970) in their earlier study, which was performed in farrowing houses with older technologies, recorded 8.37 weaned piglets; this was by 0.41 piglet less than in housing B. Similar results were published also by Andreevov, Ilievov and Todorov (1990) who analysed performance of lactating sows and described 8.24 reared piglets per litter. Wolf *et al.* (2008) document in their work, that the quantity of reared piglets should exceed number 11.

Tab. II and Fig. 2 show losses of piglets from birth to weaning per litter. In the group of sows stabled in farrowing house A (housing A), the losses in pieces achieved 1.48 ± 1.04 against the sows in farrowing house B (housing B), where the losses were 2.60 ± 1.63 pieces. The difference between the farrowing houses was 1.12 piglet in favor of more modern housing (housing A). In percentage the losses in housing A were 12.56 ± 8.50 versus 22.29 ± 13.46 in housing B, which means that the difference between the groups is 9.73%. The statistical evaluation showed highly statistically significant difference ($P \leq 0.001$) in favor of housing A. Paška (1997) mentioned that in a group of sows of the Large White breed, the loss was 1.20 piglet while in a group of hybrids Large White x Czech Improved Meaty White it was equal to 1.60 piglet. Similar results were published also by Kašpar and Vejnar (1980) who found out that losses in pens and in a combined system of housing were 1.56 *vs.* 1.47

I: *Basic statistical characteristics of selected reproductive parametres by housing*

Parameter	Housing	n of litters	n of piglets	Mean ± SD	X_{min}	X_{max}	Conclusiveness
Total number of piglets (pcs/litter)	A	40	527	13.18 ± 1.85	9	18	NS
	B	40	521	13.03 ± 1.91	9	17	
Number of live-born piglets (pcs/litter)	A	40	460	11.50 ± 1.36	9	14	NS
	B	40	455	11.36 ± 1.46	8	14	
Number of stillborn piglets (pcs/litter)	A	40	67	1.68 ± 1.49	0	6	NS
	B	40	66	1.65 ± 1.17	0	5	
Number of reared piglets (pcs/litter)	A	40	401	10.03 ± 1.33	7	13	***
	B	40	351	8.78 ± 1.56	6	12	

NS $P \geq 0.05$; *** $P \leq 0.001$

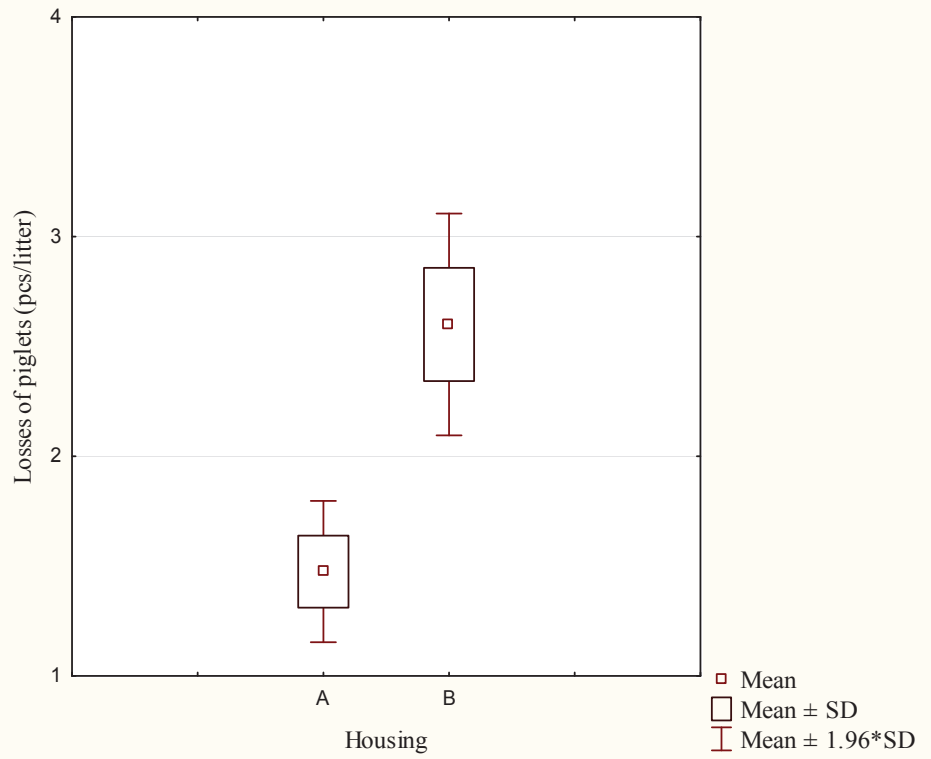


1: *Number of reared piglets by the housing (pcs/litter)*

II: *Basic satistical characteristics of losses of piglets by the housing*

Parameter	Housing	n of litters	n of piglets	Mean ± SD	X_{min}	X_{max}	Conclusiveness
Number of live-born piglets (pcs/litter)	A	40	460	11.50 ± 1.36	9	14	NS
	B	40	455	11.36 ± 1.46	8	14	
Number of reared piglets (pcs/litter)	A	40	401	10.03 ± 1.33	7	13	***
	B	40	351	8.78 ± 1.56	6	12	
Losess of piglets (pcs/litter)	A	40	59	1.48 ± 1.04	0	5	***
	B	40	104	2.60 ± 1.63	0	6	
Losses of piglets (%/litter)	A	40	59	12.56 ± 8.50	0	41.67	***
	B	40	104	22.29 ± 13.46	0	50.00	

NS $P \geq 0.05$; *** $P \leq 0.001$



2: *Losses of piglets by the housing (pcs/litter)*

piglets per litter, respectively. According to Rootwelt *et al.* (2012) the losses of piglets from the live-born to the weaned in problematic herds reaches 16.20%. Results obtained by Mellor and Stafford (2004) indicated that in individual technologies the overlaying of piglets was the most frequent cause of losses. Weary *et al.* (1996), who compared different types of farrowing houses, mentioned that piglets were laid on most frequently on the first day of their life (i.e. immediately after their birth) than later on. This could be explained by the fact that on the day of parturition the sows were more active than during the following days. Important point was also the protective role of metallic barriers that reduced the risk of overlaying and, last but not least, the necessity of ensuring the thermal comfort in nests situated out of sow's reach. The importance of adequate structural elements and localisation of the heat source out of sow's reach was mentioned also by Damm *et al.* (2000). Marchant *et al.* (2000) emphasised the importance of adjustable length of crates. According to Andersen *et al.* (2005), who analysed losses of piglets due to overlaying, the highest losses occurred within the first five days of the life of piglets.

CONCLUSION

The experiment showed no statistical differences in the total number of piglets and the numbers of live-born and stillborn piglets per litter between evaluated sows within used technologies of stabling in farrowing houses. The evaluation of reared piglets per litter revealed highly statistically significant difference ($P \leq 0.001$) in favor of sows stabled in more modern operation. Also the evaluation of the losses of piglets from birth to weaning proved highly statistically significant difference ($P \leq 0.001$) in favor of more modern housing. These findings prove that modern technologies of housing applied in farrowing houses of sows lead to better parametres of performance of sows and losses of piglets from birth to weaning, which indicates the necessity of modernization of stables for sows.

Acknowledgement

This study was supported by the project of MENDELU internal grant agency, Faculty of Agriculture No. TP 5/2014 and the NAZV Project No. QI 111A166 of the Ministry of Agriculture of the Czech Republic.

REFERENCES

ANDREEV, A., ILIEV, A. and TODOROV, M. 1990. Výzkum stájového prostředí a užitkovosti kojících prasnic v lehkých stájích pro prasata. In: *Sborník referátů z mezinárodní konference: Problémy chovu prasat ve velkovýrobních podmínkách.* Praha: Vysoká škola zemědělská Praha.

ANDERSEN, I. L., BERG, S. and BØE, K. E. 2005. Crushing of piglets by the mother sow (Sus scrofa) – purely accidental or a poor mother? *Appl. Anim. Behav Sci*., 93(1): 229–243.

ARANGO, J., MISZTAL, I., TSURUTA, S., CULBERTSON, M., HOLL, J. W., and HERRING, W. 2006. Genetic study of individual preweaning mortality and birth weight in Large White piglets using threshold-linear models. *Livest. Sci.,* 101(1–3): 208–218.

DAMM, B. I., VESTERGAARD, K. S., SCHRODER-PETERSEN, D. L. and LADEWIG, J. 2000. The effects of branches on prepartum nest building in gilts with access to straw. *Appl. Anim. Behav Sci*., 69(2): 113–124.

DAMM, B. I., MOUSTSEN, V., JØRGENSEN, E., PEDERSON, L. J., HEISKANEN, T. and FORKMAN, B. 2006. Sow preferences for walls to lean against when lying down. *Appl. Anim. Behav Sci*., 99(1): 53–63.

GU, Z., GAO, Y., LIN, B., ZHONG, Z., LIU, Z., WANG, C. and LI, B. 2011. Impacts of a freedom farrowing pen design on sow behaviours and performance. *Prev. Vet. Med*., 102(4): 296–303.

HORKÝ, P. 2014. Influence of increased dietary selenium on glutathione peroxidase activity and glutathione concentration in erythrocytes of lactating sows. *Ann. Anim. Scie*., 14(4): 869–882.

HORKÝ, P., JANČÍKOVÁ, P., SOCHOR, J., HYNEK, D., CHAVIS, G. J., RUTTKAY NEDECKÝ, B., CERNEI, N., ZÍTKA, O, ZEMAN, L., ADAM, V. and KIZEK, R. 2012. Effect of organic and inorganic form of selenium on antioxidant status of breeding boars ejaculate revealed by electrochemistry. *Int. J. Electrochem. Sc*., 7(10): 9643–9657.

HORKÝ, P., RUTTKAY-NEDECKÝ, B., KREMPLOVÁ, M., KRYŠTOFOVÁ, O., KENŠOVÁ, R., HYNEK, D., BABULA, P., ZÍTKA, O., ZEMAN, L., ADAM, V. and KIZEK, R. 2013. Effect of different doses of organically bound selenium on antioxidant status and levels of metal ions in postpartum sows. *Int. J. Electrochem. Sc*., 8(5): 6162–6179.

KAŠPAR, F. and VEJNAR, J. 1980. Vliv omezeného pohybu na výskyt poruch reprodukce a zdraví prasnic v podmínkách velkochovů. *Živočišná výroba*, 25(7): 553–560.

KILBRIDE, A. L., MENDL, M., STATHAM, P., HELD, S., HARRIS, M., COOPERA, S. and GREENA, L. E. 2012. A cohort study of preweaning piglet mortality and farrowingaccommodation on 112 commercial pig farms in England. *Prev. Vet. Med*., 104(3–4): 271–291.

KNAP, J. and HÁJEK, J. 1970. Hodnocení různých způsobů ustájení kojících prasnic a selat ve vztahu k užitkovosti. *Živočišná výroba*, 15(12): 893–900.

MARCHANT, N. J., RUDD, A. R. and MENDL, M. T. 2000. Timing and causes of piglet mortality in alternative and conventional farrowing systems. *Vet. Rec*., 147(8): 209–214.

MELLOR, D. J. and STAFFORD, K. J. 2004. Animal welfare implications of neonatal mortality and morbidity in farm animals. *Vet. J*., 168(2): 118–133.

NEJEDLÝ, J. 1999. Co lze očekávat na přelomu tisíciletí v technologiích chovu prasat. In: *Sborník referátů z celostátní konference: Aktuální problémy chovu prasat*. Praha: Česká zemědělská univerzita v Praze.

NGUYEN, K., CASSAR, G., FRIENDSHIP, R. M., REWEY C., FARZAN, A. and KIRWOOD, R. N. 2011. Stillbirth and preweaning mortality in litters of sows induced to farrow with supervision compared to litters of naturally farrowing sows with minimal supervision. *J. Swine Health Prod*., 19(4): 214–217.

OLIVIERO, C., HEINONEN, M., VALROS, A., HÄLLIA, O., PELTONIEMI, O. A. T. 2008. Effect of the environment on the physiology of the sow during late pregnancy, farrowing and early lactation. *Anim. Reprod. Sci.,* 105(3–4): 365–377.

PAŠKA I. 1997. Využitie kotercov knop v chove ošipaných. In: *Zborník referátov: Konferencie s medzinárodnou účasťou poriadanej pri príležitosti*

50. výročia založenia ústavu. Nitra: Výskumný ústav živočíšnej výroby Nitra.

RODRÍGUEZ, S. V., PLÀ, L. M. and ALBORNOZ, V. M. 2012. Modeling tactical planning decisions through a linear optimization model in sow farms. *Livest. Sci.*, 143(2–3): 162–171.

ROOTWELT, V., REKSEN, O. and FRAMSTAD, T., 2012: Production traits of litters in 2 crossbred Duroc pig lines. *J. Anim. Sci.*, 90(1): 152–158.

SCHNEIDER, J. F., REMPEL, L. A., ROHRER G. A. and BROWN-BRANDEL, T. M. 2011. Genetic parameter estimates among scale activity score and farrowing disposition with reproductive traits in swine. *J. Anim. Sci.*, 89(11): 3514–3521.

ŠPINKA, M. and ILLMANNOVÁ, G. 1995. Skupinové ustájení rodících a kojících prasnic. In: *Sborník z odborného semináře: Nové trendy a poznatky v živočišné produkci*. České Budějovice: Jihočeská univerzita v Českých Budějovicích, 106–109.

VANDERHAEGHE, C., DEWULF, J., DE VLIEGHER, S., PAPADOPOULOS, G. A., DE KRUIF, A. and MAES, D. 2010. Longitudinal field study to assess sow level risk factors associated with stillborn piglets. *Anim. Reprod. Sci.*, 120(1–4): 78–83.

WEARY, D. M., PAJOR, E. A., FRASER, D. and HONKANEN, A. M. 1996. Sow body movements that crush piglets: a comparison between two types of farrowing accommodation. *Appl. Anim. Behav Sci.*, 49(2): 149–158.

WOLF, J., ŽÁKOVÁ, E. and GROENEVELD, E. 2008. Within-litter variation of birth weight in hyperprolific Czech Large White sows and its relation to litter size traits, stillborn piglets and losses until weaning. *Livest. Sci.*, 115(2–3): 195–205.

Contact information

Pavel Nevrkla: pavel.nevrkla.uchhz@mendelu.cz
Zdeněk Hadaš: zdenek.hadas@mendelu.cz