

## INFLUENCE OF CARCASS WEIGHT ON THE BELLY MEAT PART FORMATION IN PIGS

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### Abstract

The trial was performed in 194 final hybrid pigs of well-balanced sex in commonly used breeding combinations in the Czech Republic. The objective was to examine the belly meat part formation with respect to its total content as well as its formation in the carcass and lean meat share depending on achieved carcass weight.

It was demonstrated that increasing weight within the monitored group of pigs does not result in higher belly share in the carcass, whereas the percentage growth of EU-belly as well as total belly part was consistent. The increasing carcass weight results with dramatically lower rising of absolute amount of lean meat in the belly (2,05kg/95kg vs. 2,33kg/115kg) whereas belly lean meat share decreased (55,68%/95kg vs. 52%/115kg). Lean meat share and belly one do not achieve the same values. The higher carcasses the higher difference between them.

### Introduction

Development of genetic potential in carcass value, especially in lean meat share, demands consequent monitoring and evaluation of all factors including slaughter weight which dramatically affects slaughter realization in pigs.

The age of pigs is closely connected with live weight. Lean meat and fat part contents are changed with increasing slaughter weight in pigs. Together with this the carcass value is changed (Hovorka, 1989; Cisneros et al., 1996). William et al. (1990) pointed out that slaughter weight is the most important factor affecting the carcass value. Hruška, (1997) refers to the fact that slaughter weight in pigs affects lean meat share in the carcass and subsequently the pig SEUROP classification. Poďěbradský (1994) confirms in his work that lean meat share is higher by 2-3 % with decreasing slaughter weight from 115 kg to 110 kg live weight.

For achievement of higher lean meat share in the carcass and better realization it is efficient to focus on increasing lean meat share in individual carcass parts. From point of the view as a very interesting part appear belly and its meat/fat content. Lonergan et al. (2001) found out that selection for high increase of lean meat content in pigs is connected with better meat formation and its content in belly, higher MLLT area as well as decreased fat formation.

Gabriš (1961), Munk (1961), Župka et al. (1962), Majerčíak (1967), Kvapil (1968), Kopecký (1969), Kopecký et al. (1972) pointed out on decreasing levels of traits characterizing lean meat share and increasing trait levels characterizing fat share in the carcass with increasing age in pigs.

According to William et al. (1990) fat share in the belly increases more than in other carcass parts with increasing slaughter weight. Gráčík et al. (1986) found out that percentage of individual carcass parts decrease with increasing live weight.

The belly share represents in 100 kg 16,28 kg = 21,14%, 110 kg 17,92kg = 21,25%, 120 kg 19,89kg = 21,40%, 130 kg 21,44kg = 21,83%, 140 kg 23,36kg = 22,02% and in 150 kg 26,42kg = 23,13%.

### Material and Methods

The analysis of belly meat part included in total 194 slaughter pigs of final hybrids tested in the test station of Department of Animal Science of Czech University of Life Sciences in Prague.

The pigs of balanced sex were slaughtered at the age of 166-175 days. In order to perform an objective analysis of carcass body weight influence on belly meat part formation, the monitored group was divided into 6 subgroups according to achieved carcass weight namely less 95 kg, 95-100 kg, 100-105 kg, 105-110 kg, 110-115 kg and more than 115 kg.

The slaughter pigs included in the test were fed according to the standards of the need of nutrients after Šimeček et al. (2000) ad-libitum in three phases with a continuous transition by means of self-feeders Durūamat.

The pigs were penned according to the methodology for testing thoroughbred and hybrid pigs observing the principle of penning of animals in couples.

Dissection of the belly was made according to the EU methodology, separating the frontal part of the belly between 4th and 5th rib, the anterior part of the belly was separated by a section made 4 cm caudally behind the last rib first vertically and subsequently cranially close to the row of mammary glands ducts. In order to evaluate the belly formation with the subsequent determination of the estimate of the share of lean meat in the carcass belly, radiographs were made of the section of the carcass part of the EU belly at three points according to the methodology of Schwerdtfeger et al. (1993), namely section 1 behind the last rib, section 2 between 10<sup>th</sup> and 11<sup>th</sup> rib and section 3 between 7<sup>th</sup> and 8<sup>th</sup> rib.

The LUCIA programme of the company Laboratory Imaging Ltd. was used to measure in sections 1, 2 and 3 the area of the belly ( $\text{mm}^2$ ), the area of the meat ( $\text{mm}^2$ ) and the ratio of lean meat in the section area of the belly to the total area of the belly (%).

Lean meat and its share in the belly was calculated by means of the equation after Čitek (2002)

$$y = 42,63841413 + 0,24603687 * PLPODIL2 - 3,43803239 * HMEU - 0,00098125 * PLCELK3 + 0,00254507 * PLMASO3 + 0,00088281 * PLMASO1$$

( $r^2 = 0,857$ )

PLPODIL2 = the ratio of the area of lean meat to the total area of the belly at the point of section 2 (%),

HMEU = weight of the part of the belly dissected according to EU (kg),

PLCELK3 = total area of the belly at the point of section 3 ( $\text{mm}^2$ ),

PLMASO1 = the area of lean meat at the point of section 1 ( $\text{mm}^2$ ),

PLMASO3 = the area of lean meat at the point of section 3 ( $\text{mm}^2$ ).

### Results and Discussion

The monitored group of pigs was divided into 6 sub-groups with 5 kg live weight difference.

The performed evaluation of belly meat part content in the carcass shows table 1.

Within examination of belly carcass part as a whole was logically found out that there was statistically significant increasing of belly meat part with increasing live weight in pigs.

Providing that group with live weight up to 95kg presents 100% of carcass belly part, it could be stated that in other groups the carcass belly part represents 108.3, 112.8, 114.8, 118.2 and 123.7%. The differences were 8.3, 12.8, 14.8, 18 and 23.7%.

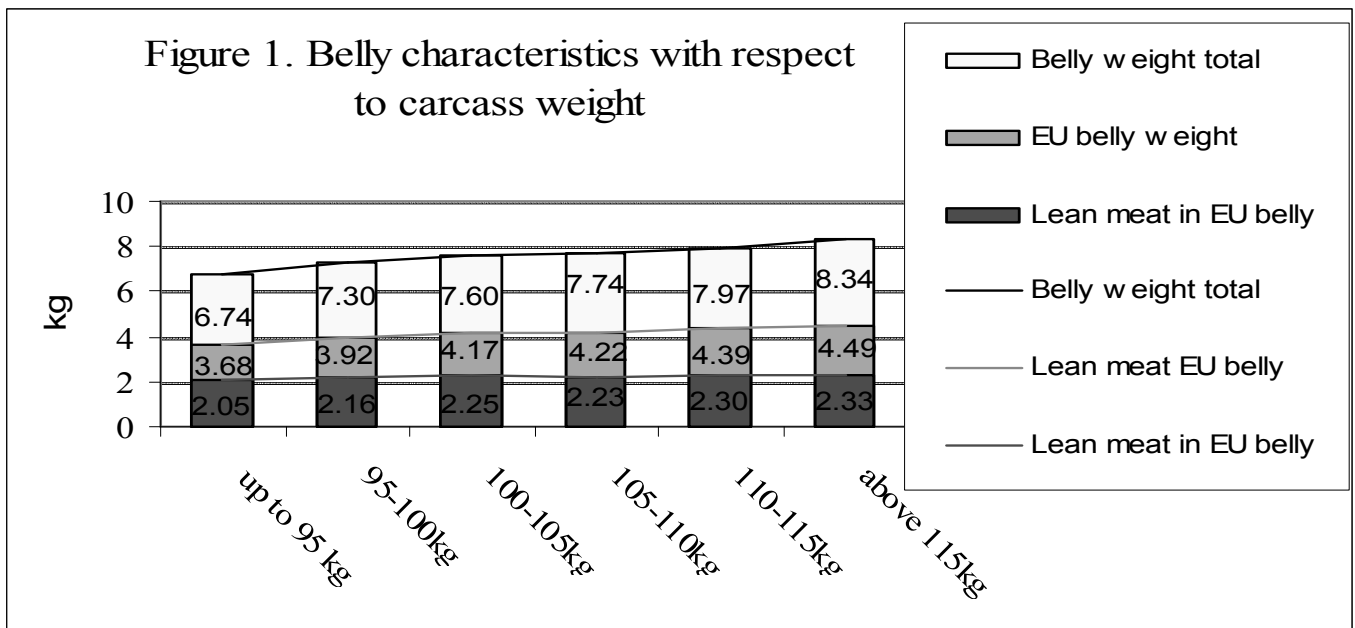
On the other hand there were found out no significant differences among monitored groups as regards percentage of belly in the carcass. It could be mentioned that there is no higher belly share in the carcass with increasing weight within monitored group of pigs. The same tendency was obtained in EU-belly part from carcass as well as in percentage of EU-belly part from total belly and from carcass.

By detailed survey of achieved weight of EU-belly from carcass it could be mentioned that supposing EU-belly weight in pigs up to 95kg live weight is 100 %, other groups will achieve following levels: 106.5, 113.3, 114.6, 119.3 and 122%. Then differences are 6.5, 13.3, 14.6 19.3 and 22%. Comparing these differences with values found out in total belly part, it is evident that there is the same percentage rising in both monitored indicators. Trend of rising with increasing weight of pigs is kept in belly lean meat share. Statistically significant differences were obtained especially between the lightest and the heaviest group. If lean meat in belly in group with live weight up to 95 kg will be considered as 100%, then values in other groups increase on 105.3, 109.8, 108.7, 112.2 and 113.7%.

It is evident that the belly lean meat share rise much lower with increasing weight of pigs.

As regards lean meat percentage in belly, decreasing belly lean meat share with increasing weight of pigs could be monitored. It could be said that belly share in relation to carcass is not markedly changed with increasing weight, but belly lean meat share is decreasing (figure1). It is caused by higher fat deposition in comparison with meat in pigs with higher weight.

The same tendency is findable for lean meat percentage in the carcass. It is obvious that carcass lean meat share and belly lean meat share do not achieve the same values and this difference rises with increasing weight.



**Table1. Estimation of the belly-meat part with respect to lean meat share in pig carcasses**

Indicator	less 95kg				95kg - 100kg			
	n	$\bar{x}$	$\pm$	$S_x$	n	$\bar{x}$	$\pm$	$S_x$
Total belly weight, [kg]	9	6,74	ABCDa	$\pm$ 0,10	13	7,30	EFGa	$\pm$ 0,16
Total belly share in the right half [%]	9	17.67		$\pm$ 0.32	13	18.23		$\pm$ 0.37
EU belly weight [kg]	9	3.68	ABCD	$\pm$ 0.10	13	3.92	EFGa	$\pm$ 0.14
EU belly share in the right half [%]	9	9.66		$\pm$ 0.31	13	9.78		$\pm$ 0.32
EU belly share in the total belly [%]	9	54.63		$\pm$ 1.37	13	53.58		$\pm$ 1.23
Lean meat in EU belly [kg]	9	2.05	ABab	$\pm$ 0.05	13	2.16	cd	$\pm$ 0.08
Lean meat share in EU belly [%]	9	55.68	ab	$\pm$ 1.12	13	55.27	cd	$\pm$ 0.94
Lean meat share in pig carcasses [%]	9	57.03		$\pm$ 1.19	13	57.30		$\pm$ 0.91
Indicator	100kg - 105kg				105kg - 110kg			
	n	$\bar{x}$	$\pm$	$S_x$	n	$\bar{x}$	$\pm$	$S_x$
Total belly weight [kg]	44	7.60	AHI	$\pm$ 0.08	59	7.74	BEJb	$\pm$ 0.06
Total belly share in the right half [%]	44	18.14		$\pm$ 0.15	59	17.76		$\pm$ 0.12
EU belly weight [kg]	44	4.17	AHIa	$\pm$ 0.05	59	4.22	BEJb	$\pm$ 0.05
EU belly share in the right half [%]	44	9.96		$\pm$ 0.12	59	9.68		$\pm$ 0.10
EU belly share in the total belly [%]	44	54.90		$\pm$ 0.44	59	54.48		$\pm$ 0.41
Lean meat in EU belly [kg]	44	2.25	a	$\pm$ 0.03	59	2.23	b	$\pm$ 0.03
Lean meat share in EU belly [%]	44	54.00		$\pm$ 0.62	59	53.04		$\pm$ 0.51
Lean meat share in pig carcasses [%]	44	55.74		$\pm$ 0.54	59	56.72		$\pm$ 0.58
Indicator	110kg - 115kg				over 115kg			
	n	$\bar{x}$	$\pm$	$S_x$	n	$\bar{x}$	$\pm$	$S_x$
Total belly weight [kg]	46	7.97	CFHKb	$\pm$ 0.09	22	8.34	DGIJK	$\pm$ 0.14
Total belly share in the right half [%]	46	17.69		$\pm$ 0.17	22	17.85		$\pm$ 0.30
EU belly weight [kg]	46	4.39	CFHb	$\pm$ 0.05	22	4.49	DGIJ	$\pm$ 0.09
EU belly share in the right half [%]	46	9.75		$\pm$ 0.12	22	9.61		$\pm$ 0.18
EU belly share in the total belly [%]	46	55.09		$\pm$ 0.43	22	53.93		$\pm$ 0.80
Lean meat in EU belly [kg]	46	2.30	Ac	$\pm$ 0.03	22	2.33	Bd	$\pm$ 0.04
Lean meat share in EU belly [%]	46	52.56	ac	$\pm$ 0.66	22	52.00	bd	$\pm$ 0.91
Lean meat share in pig carcasses [%]	46	55.31		$\pm$ 0.57	22	55.02		$\pm$ 0.92

$P \leq 0,01$  A,B,C,D,E,F,G,H,I,J,K;  $P \leq 0,05$  a,b,c, d,

## Conclusion

With increasing weight within monitored group in pigs there is not rising belly content in the carcass, percentage rising in EU-belly as well as in total belly part is the same, rising of total lean meat in belly is substantially lower, belly lean meat share decreases, lean meat share in carcass as well as in belly do not achieve the same values, the higher carcass, the differences are higher.

## References

- Cisneros,F., Ellis,M., McKeith,F.K., McCaw,J., Fernando,R. L.: Influence of slaughter weight on growth and carcass characteristics, commercial cutting and curing yields, and meat quality of barrows and gilts from two genotypes. *J. Anim. Sci.*, 1996, 74, 5, 925–933.
- Čítek,J.: Stanovení nejvhodnější porážkové hmotnosti jatečných prasat v České republice. Disertační práce. Praha, ČZU, 2002, 130.
- Gabriš,J.: Fyziologické štúdia bielych ušlechtilých ošípaných mäsovo-masťového typu vo váhe okolo 100kg. KDP, VŠP Nitra, 1961, 170.
- Gráčik,P., Hetényi,L., Buchová,B.: Effect of different killing weight on carcass composition of hybrid pigs. 37. EAAP, 1.-6.8. 1986, Budapest.
- Hovorka,F.: Faktory ovlivňující výkrmnost, jatečnou hodnotu a kvalitu masa, VŠZ Praha, KCHPD, 1989, 148.
- Hruška, J.: Úkoly zväzu chovateľov ošípaných na Slovensku. *Náš chov*, 1997,57, 4, 8–9.
- Kvapil,O.: Stanovení nejvhodnější porážkové váhy prasat plemene bílého ušlechtilého, landrace a kříženců. ZVÚ, 1968,VÚCHP Kostelec n.O.
- Kopecký,O.: Příspěvek ke studiu váhového podílu masa, tuku a kostí u bílých ušlechtilých prasat v různé porážkové váze. *Živ. výr.*, 1969,14, 651-658.
- Kopecký,O., Půda,J., Pasičná,N.: Analýza zkoušek masné užitkovosti prasat v porážkové váze 90 a 110 kg. *Živ. výr.*, 1972,17, 29-36.
- Lonergan,S.M., Huff,L.E., Rowe,L.J., Kuhlert,D.L., Jungst,S.B.: Selection for lean growth efficiency in Duroc pigs influences pork quality. *J.Anim.Sci.*, 2001, 79, 8, 2075-2085.
- Majerčiak,P.:Uplyv roznej živej váhy ošípaných na ich jatočné ukazovatele a ekonomiku výkrmu. *Vedecké práce*, 1967, VÚŽV Nitra, 5, 159-177.
- Munk,Z.: Průzkum výrobních schopností bílého ušlechtilého prasete při výkrmu do různé živé váhy. ZVÚ, 1961,VÚK Pohořelice.
- Poděbradský,Z.: Ekonomické aspekty zavádění nového systému zpeněžování prasat. *Náš chov*, 1994, 54, 5, 14-16.
- Schwerdtfeger,R., Krieter,J., Kalm,E.: Objektive Beurteilung des Teilstucks Bauch. *Fleischwirtschaft*, 1993, 73, 1, 93 – 96.
- Šimeček,K., Zeman,L., Heger,J.: Potřeba živin a tabulky výživné hodnoty krmiv pro prasata. ČSAZV, Komise výživy a krmení hospodářských zvířat, Brno, 2000, 124.
- William,A., Moser,A., Haiger,A.: Grobgewebliche Zusammensetzung von Schweinehälften und Teilstücken. *Forderungsdienst*, 1990, 38, 10, 302–305.
- Župka,Z., Zemánek,F., Mašek,N.: Rozbor bílého ušlechtilého prasete poraženého ve váze 20 – 200 kg.