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The comparison of prediction abilities of pig carcass dissection methods

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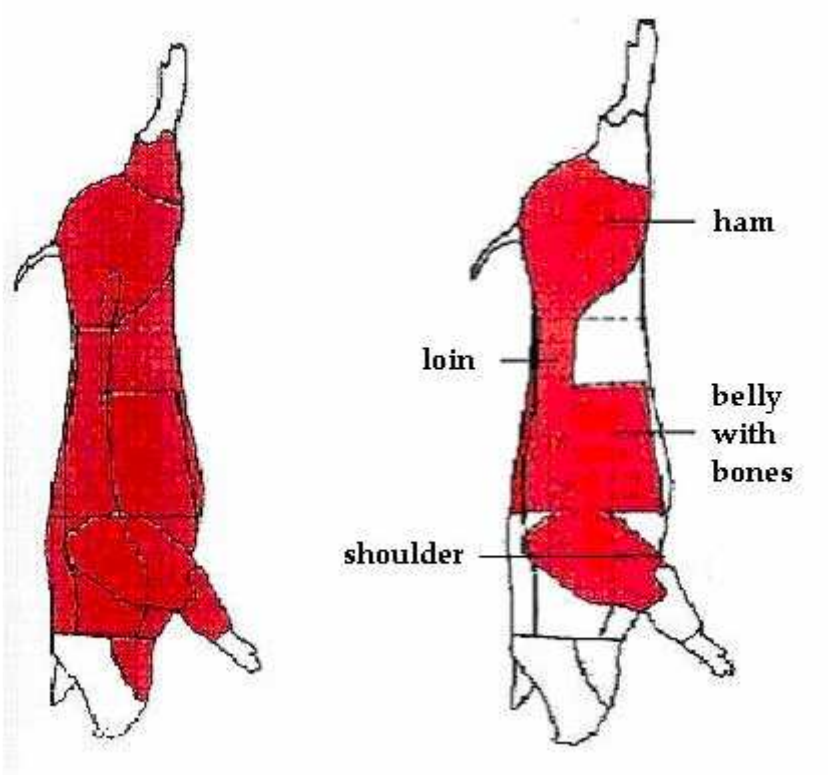
Abstract: Results of full and simplified dissections of pig carcasses were analysed. The dissections are conducted on a sample of carcasses representing the pig production in a certain geographic area and time period. Earlier only full dissections based on cutting all the carcass parts except for head and feet were used. Muscle is defined as striated muscles that can be separated by knife from other tissues. This approach is, however, extremely time and labour consuming. Therefore, a simplified dissection method was developed. It is based on dissections of leg, shoulder, tenderloin, loin and belly with bones. According to this method, connective tissue is also included into the muscle weight. The coefficient 1.3 is used to recalculate the value for the whole carcass. Totally 20 carcasses from pig final hybrids fattened under common conditions were included into the analysis. Both full and simplified dissections were conducted on each carcass. The muscle proportions determined by full and simplified dissections were 56.85 and 56.58 %, respectively. The difference between the two values was rather low. High reliabilities of the results were also confirmed by the high correlation between the two results ($r \pm s_r = 0.97 \pm 0.053$). The obtained results suggest that the simplified dissection method is utilisable in the process of developing regression equations.
Keywords: pig; lean meat percentage; carcass dissection;

Pig carcass classification based on muscle proportion in carcass has been compulsory in the Czech Republic since 1st April 2001. The importance of introducing such a method has been stressed in earlier studies of Pulkrábek et al. (1994), Matoušek et al. (1995) and Pour (1999). Estimation of muscle proportion in carcass is based on auxiliary carcass measurements and their use in regression equations. These equations have been developed with use of information concerning actual muscle proportions obtained by carcass dissections. According to the dissection method, left carcass sides are divided into individual cuts from which muscle, bones, intermuscular fat, skin and subcutaneous fat are subsequently separated. The method was developed in Germany and described by Branscheid et al., (1987) and Sack, (1982).

The dissections are performed not only with the objective to develop regression equations but also to verify their validity. The set of carcasses used for dissections must represent pig production in a given area and time period. As reported by Engel and Walstra (1991) and Pulkrábek et al. (2001), it is necessary to verify the prediction ability of used regression equations.

Detail carcass analyses were originally performed using full dissections. Within this method, the whole left side of carcass is dissected except for head and feet. This process requires approximately 6-9 hours of labour. There is an effort to find simpler methods based on dissecting only selected parts of carcasses. This, however, must not be connected with the reduction of prediction abilities of such methods (Walstra and Merkus, 1995). To this purpose, so called simplified dissections have been introduced. The differences between full and simplified dissections are shown in Figure 1.

Figure 1: Comparison of full and simplified dissections



Highlighted parts are dissected

Only selected cuts (leg, loin, shoulder and belly with bones) are dissected within the simplified method. Total muscle proportion from these cuts including tenderloin is multiplied by the coefficient 1.3.

The objective of the study was to compare the results obtained from full and simplified dissections and to justify the selection of cuts dissected within the simplified method.

Material and methods

Totally 20 final hybrids (10 gilts and 10 barrows) of most frequently used hybrid combinations fattened under common production conditions were included into the analysis. The used hybrid combinations consisted of crosses of dam breeds (Large White and Landrace) with the most frequently used sire breeds. The other criteria for selection of a representative set of animals were in accordance with those reported by Branscheid et al. (1987). Slaughter analysis of these animals was conducted and subsequently anatomic

dissections of all cuts from left sides except for head and feet were performed. Obtained muscles were weighted and expressed as the proportion of left side weight. These values are presented as muscle proportions in carcass. Muscle is defined as skeletal muscle according to Sack (1982). Following equation was used to calculate the proportion of muscle:

$$Y = C * 100 * \frac{{}^{4}\sum (J - SSF - IF - B) + T}{{}^{12}\sum J}$$

where: Y = muscle proportion
C = 1.3 (constant)
J = mass of carcass parts before dissection
SSF = mass of subcutaneous fat including skin
IF = mass of intramuscular fat
B = mass of bones
T = mass of tenderloin
${}^{4}\sum$ = sum of the mass of the carcass' parts: leg, shoulder, loin including skin, and belly with bones
${}^{12}\sum$ = sum of the mass of all 12 carcass´ parts

The results are presented as proportions of different cuts of the total weight and as muscle proportions of the weight of given cuts. Correlations were determined between muscle proportion in cut and that in the whole carcass.

Results and discussion

The results are given in Table 1 and Table 2.

Table 1: Results of simplified dissections of selected cuts

Carcass cut (including fat cover)	Proportion of carcass weight (%)	Muscle proportion of cut weight (%)
Leg	25.65	73.11
Shoulder	12.09	67.06
Loin	17.60	57.87
Tenderloin	1.18	100.00
Belly with bones	9.63	57.35

Table 2: Correlations between muscle proportions in selected cuts and muscle proportion in carcass

Carcass cut	Correlation between muscle proportion in cut and muscle proportion in carcass
Leg	0.95
Shoulder	0.95
Loin	0.93
Belly with bones	0.93
Neck	0.77
Rear hock	0.69
Jowl	0.65
Belly without bones	0.58
Groin	0.53

Table 1 shows the weight proportions of cuts involved in the simplified dissection and also their muscle proportions. The cut with the highest weight proportion was leg (25.65 %) followed by loin (17.60 %), shoulder (12.09 %), belly with bones (9.63 %) and tenderloin (1.18 %). Thus the total proportion of dissected cuts was 66 % of carcass weight. Muscle proportions in leg, shoulder, loin and belly with bones were 73.11, 67.06, 57.87 and 57.37 %, respectively. Tenderloin is composed of muscle only.

Total carcass muscle proportions determined by full and simplified dissections were 56.85 and 56.58 %, respectively. The difference between these values was very small which is also confirmed by a high correlation between the two proportions ($r \pm s_r = 0.97 \pm 0.053$).

Correlations between muscle proportions in different cuts and in the whole carcass determined by full dissections are given in Table 2. There is an effort to use such carcass cuts for simplified dissections that are highly correlated to the muscle proportion in the whole carcass. At the same time it is important to reduce time and labour demands while the accuracy of estimation should remain the same (Walstra and Merkus, 1995). The selection of different cuts for simplified dissections can be justified by high correlation coefficients 0.95, 0.95, 0.93 and 0.93 (Table 2) for leg, shoulder, loin and belly with bones, respectively. In comparison to these values, the correlation coefficient for neck is much lower (r=0.77) in spite of the fact that this part is classified among main meaty parts in the Czech Republic. In contrast, belly with bones with muscle proportion 7 % lower compared to neck is highly correlated with carcass muscle proportion (r=0.93) and belongs to the cuts used for simplified dissections.

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