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PORK QUALITY AND METHODS OF ITS EVALUATION – A REVIEW*

Maria Koćwin-Podsiadła[1], Elżbieta Krzęcio[1], Wiesław Przybylski[2]

[1]Chair of Pig Breeding and Meat Science, University of Podlasie, Siedlce; [2]Department of Engineering and Catering Technology, Warsaw Agricultural University, Warsaw

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The aim of this review was to present the basic meat quality deviations, criteria and methods identifying quality of meat as well as to define their outside values for selection in breeding herds and for classification of meat quality for the meat processing industry.

Over the years 1988–2004, the research team of the Chair of Pig Breeding and Meat Science elaborated (determining the criteria and their threshold values) and verified the value and efficiency of six methods of diagnosing meat with qualitative defects, based on measurements of selected physico-chemical properties. Among those six methods five are post-slaughter and one is conducted on the live animal.

On the basis of a wide range of studies one may state that special attention should be paid to three of the five post-slaughter methods of diagnosing the quality of pork. Those methods are based on the following criteria: pH_1, R_1 (C_R=0.647**); pH_1, pH_{24} (C_R=0.641**); EC_{120}, pH_{24} (C_R=0.624* for technological usefulness traits and C_R=0.770** for culinary traits of meat). These parameters determine, to a high degree, other qualitative and technological properties of pork (C_R^2 in 0.419, 0.411, 0.390 and 0.590, respectively). Those relations are interesting from a practical point of view. Each of these three methods may be used in breeding work and classification methods based on the values obtained for pH_1 and pH_{24} as well as EC_{120} and pH_{24} are recommended for the meat industry.

MEAT QUALITY AND DEFECTS

The quality of pork is determined – beside its chemical composition and nutritive value – by such factors as the health condition of the animal and value of palatability and technological indicators which, in turn, are the result of the direction and intensity of biochemical autolytical processes occurring after slaughter. The joint effect of those factors produces the final culinary, technological and palatability properties of both raw meat and the final product. The principal properties determining the technological and consumption value of meat are: acidity, colour together with its uniformity and stability, water binding and holding capacity, gelling and emulating properties, storage durability, processing yield, external appearance (colour and marbling – content of intramuscular fat), texture (delicacy and juiciness), taste (taste and aroma). The variability in pork quality is determined principally by the intensity and range of proteolytic and glycolytic metabolism taking place *post mortem*, as it has a significant effect on the meat properties listed.

Qualitative meat properties have interested many scientists for over half a century. From the first observations reported by Ludvigsen [1953], Briskey [1964] and Wismer-Pedersen & Briskey [1961] numerous biological traits have been found to determine the quality of raw and processed meat – traits referring to the microbiological condition, physico-chemical properties as well as culinary and technological value.

Unfavourable qualitative changes in the muscle tissue of pigs have been collected into five classes of meat defects: exudative meat of three types (PSE – Pale, Soft, Exudative, RSE – Reddish, Soft, Exudative and RFE – Reddish-Pink, Firm, Exudative); acid meat (AM); and DFD meat (Dark, Firm, Dry) (Figure1).

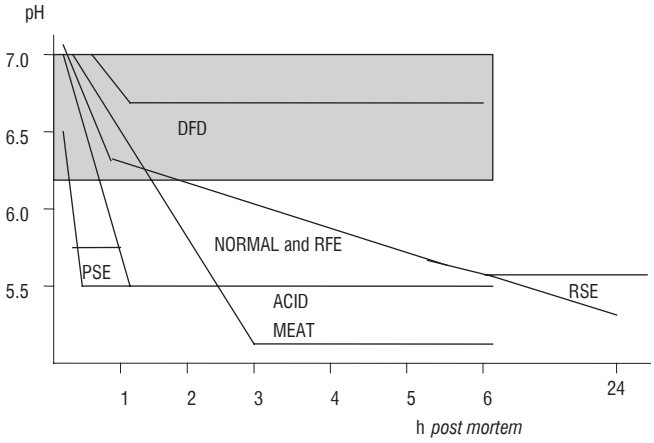

FIGURE 1. The dependency between pH of muscle tissue changes after slaughter and meat quality [Monin, 1989; Koćwin-Podsiadła, 1993a, 1994; Warner, 1994; Koćwin-Podsiadła *et al.* 2004].

The principal types of defective meat, *i.e*. exudative and pale or over dry and dark (PSE and DFD) were described

Author's address for correspondence: prof. Maria Koćwin-Podsiadła, Chair of Pig Breeding and Meat Science, University of Podlasie, ul. Prusa 14, 08-110 Siedlce, Poland; tel. (48 25) 643 12 58; e-mail: kocwin@ap.siedlce.pl

TABLE 1. The level of indicators of energetic changes in muscles of animal with normal and faulty meat [Prost, 1985; Koćwin-Podsiadła, 1993a, 1998, Koćwin-Podsiadła *et al.*, 1989, 2004b].

Indicators of energetic changes	Level at 1 h *post mortem*					Level at 24 h *post mortem*				
	Normal	RFE	PSE	DFD	Acid Meat	Normal	RFE	PSE	DFD	Acid Meat
ATP	high	Intermediate between PSE and Normal	low	low	high	low	low	low	low	low
Glycogen	high	Intermediate between PSE and Normal	low	low	very high	low	low	low	low	medium
Lactate	low	Intermediate between PSE and Normal	high	low	low	high	high	high	low	high
pH	high	Lower then normal at about 0.1–0.2 units	low	high	high	low	low	low	high	low
IMP/ATP	low	Intermediate between PSE and Normal	high	high	low	high	high	high	high	high

TABLE 2. The properties of normal and faulty meat [Prost, 1985; Koćwin-Podsiadła, 1993a, 1998; Koćwin-Podsiadła *et al*. 1993a, 1996, 1998, 2004b].

Traits	Normal	RFE	PSE	DFD	Acid Meat
Shelf life	normal	good	good	low	very good
Water binding	normal	bad	bad		bad
Weight loss of raw meat (WN_{48})	normal (2–6%)	very high (>6.0%)	high (>6.0%)	low (≤2.0)	high (>6.0%)
Weight loss after curing and smoking (72°)*	normal	high (2–3% higher then normal meat)	high (2–3% higher then normal meat)	low	very high (6–9% high than normal meat
RTN (%)	≥91	<91	<91 (very low)	≥91	<91
Colour (L-meat lightness)	correct (52–58)	(52–58)	pale (>58)	dark (<52)	sligtly lighter than normal meat
Taste	good	good	strong acidity	bad	strong acidity
Consistency	normal	firm	soft	firm	normal
Tenderness and juiciness	correct	incorrect (dry)	correct	dry	very good
Result of curing and smoking	correct	bad	bad		(about 6% higher than normal meat)
Technological usefulness	all products culinary meat	alternatively only durable products	alternatively only durable products	alternatively only cooking products	raw and durable products

* in production of "sopocka loin" , WN_{48} – drip loss at 48 h *post mortem* (%), RTN – technological yield

by Briskey already in 1964. The properties of acid meat were described for the first time by scientists from the INRA, France, in 1986; those of soft watery meat with a reddish-pink colour, typical of normal meat (RSE) were described in 1994 by Warner, University of Wisconsin, those of exudative and firm but with a colour typical of normal meat were described in 2004 by a team from the Chair of Pig Breeding and Meat Science [Koćwin-Podsiadła *et al*., 2004b]. The characteristics of meat of individual types are presented in Tables 1 and 2.

The principal reasons for the deterioration of pork quality lie in: changes in the genotype of pigs; excessive intensification of methods of breeding, maintenance and nutrition; stress conditions of pre-slaughter management as well as of slaughter itself (loading, transport, unloading, duration and conditions of pre-slaughter storage, duration and conditions of stunning, duration and position of bleeding); carcass treatment after slaughter.

The frequency of occurrence of defective meat is closely related to genetic factors, *i.e*. the quality of breeds and lines bred in a given country as regards the improvement of their genotype for outstanding muscle deposition traits and the burdening of animals with major genes, which have a negative effect on meat quality. Such factors as the animals' age and body weight and environmental factors referring to the rearing conditions, pre-slaughter management, slaughter and treatment of carcasses directly after slaughter also affect the occurrence of faulty pork.

It has been shown by Dutch and Polish research workers that genetic factors related to breed and its genetic predispositions to produce defective meat are only in 20–30% responsible for the occurrence of such meat after slaughter. Among the factors listed, the greatest share falls to environmental factors, including those connected with pre-slaughter (15–25%) and slaughter (40%) management.

Among the five classes of defective meat listed, the genetic back-ground has been determined for two – PSE and AM. Today it is known that a majority of pork qualitative traits, related to PSE and AM symptoms and thus to their culinary and technological value, is controlled principally by major genes RYR1 (gene of susceptibility to stress) and RN^- (gene of technological NAPOLE yield).

Due to the studies on molecular genetics conducted over the past 15 years it has become possible to elaborate a breeding strategy aiming at the elimination or considerable limiting of the occurrence of such meat defects after slaughter. This made it possible to steer the quality of pork. The DFD defect – as an effect of unfavourable environmental conditions – was minimized already during the nineties through the modernization of regulations on the organization and technical conditions of the pre-slaughter management of animals. The other meat defects – exudative type RSE, identified in 1994 and RFE, identified in 2004 – are currently the subject of numerous studies aimed at determining their genetic conditioning.

From the point of view of the consumer and the processing plant of interest is the elucidation of the so far unknown genetic background of the occurrence of meat with a very high drip loss (RFE) in the carcasses of animals resistant to stress (for which the genotype AB at *locus CAST/Hinf*I is responsible) or being heterozygotes as regards gene RYR1 (genotype BB at *locus CAST/Hinf*I and AA at *locus CAST/Msp*I) [Koćwin-Podsiadła *et al.,* 2003b]. The genotype *CAST/Rsa*I in a population free of gene $RYR1^T$ explains also up to 3.8 pp the volume of drip loss in animals rn^+rn^+ and up to 4.8 pp in the case of animals with genotype RN^-/? [Koćwin-Podsiadła *et al*., 2004c].

METHODS OF IDENTIFYING FAULTY MEAT

The comparatively often observed occurrence of defective meat, increased consumer requirements and economic consequences (for instance, according to Meyer *et al*. [1996] in the USA 1.3 billion dollars are lost as a result of processing low quality pork; in turn Pospiech *et al*. [1998] report that the losses of the Polish meat processing plants caused by PSE and RSE meat constitute 2.4% of the value of the slaughter animals purchased) resulted in a considerable interest in the search for methods of detecting defective meat. In international practice the evaluation of meat quality is based on very different criteria. The most popular criteria, rendering it possible to identify defective meat, include the pH value, measured in the muscle tissue 45–60 min (pH_1) and 24 hours (pH_{24}) after slaughter, indicator R_1, expressed by the IMP/ATP ratio and determining the intensity of ATP degradation within 45 minutes *post mortem*, meat colour and drip loss, measured 24 hours *post mortem* and electrical conductivity, measured during minute 45 (EC_{45}) and hour 24 (EC_{24}) *post mortem*.

The threshold values of the indicators mentioned differ considerably between authors. Among numerous, known in literature, methods for detecting defective meat, of interest are methods based on criteria measured in the *Longissimus dorsi* (LD), beyond the last breast vertebra and their threshold values, presented in Table 3.

Over the years 1988–2004, the research team of the Chair of Pig Breeding and Meat Science elaborated (determining the criteria and their threshold values) and verified the value and efficiency of six methods of diagnosing meat with qual-

TABLE 3. Most popular criteria of detection of faulty meat after slaughter and their thresholds.

Parameters	Marginal values for meat quality classes					Author
	PSE	partly PSE	Normal	Partly DFD	DFD	
pH_1	<6.0	6.0–6.3	>6.3	-	-	Kortz *el al.* [1968]
pH_1	≤5.8	-	>5.8	-	-	Bendal & Swatland [1988]
pH_1	<6.0	-	≥6.0	-	-	Pfeiffer [1977]
pH_{24}					>6.2 or >6.0	Wirth [1984]; Grajewska [1988]; Koćwin-Podsiadła [1993b]
pH_s	≤5.2	5.26–5.35	5.36–6.10	6.11–6.50	≥6.51	Kortz [1986]
pH_1	<5.9	-	≥5.9	-	≥5.9	Honikel & Fischer [1977]
IMP/ATP=R_1	≥1.05	-	<1.05		≥1.05	
pH_1	<6.0	<6.0	≥6.0	-	≥6.0	Koćwin-Podsiadła & Chmura-Janowiak [1989];
IMP/ATP=R_1	≥1.05	-	<1.05	-	≥1.05	Koćwin-Podsiadła [1993b]
pH_1	<6.0	<6.0	≥6.0	-	≥6.0	Koćwin-Podsiadła *el al.* [1988, 1989];
IMP/ATP=R_1	≥1.092	<1.092	<1.092	-	≥1.092	Koćwin-Podsiadła [1993]
pH_1	<5.8	<5.8	≥5.8	-	≥5.8	Koćwin-Podsiadła *et al.* [1999]
IMP/ATP=R_1	≥1.05	-	<1.05		≥1.05	
EC_{120}	>7.5	-	≤4.5	-	≤4.5	Koćwin-Podsiadła *et al.* [2002, 2003, 2004a, 2004b, 2005b]
pH_{24}	<5.5	-	5.5–5.7	-	>6.0	
Lightness (L*)-Minolta	>50	-	43–50	-	<43	Joo [1995]
Drip loss (%)	>7.5–9%	-	3.5%	-	<2%	
pH_{24}	5.0–5.6	-	5.6–5.9	-	>6.0	
pH_{45}	≤5.8	-	>5.8	-	-	Method used in German Pig Testing Stations
pH_{24}	-	-	-	-	≥6.0	
EC_{45}	≥8.3	8.3–4.3	<4.3	-	-	
EC_{24}	-	-	-	-	<4.3	

*pH_s–pH – synthetically calculated on the basis of pH fell and correlations between pH_1, pH_u and *in vivo* pH_0

itative defects, based on measurements of selected physico-chemical properties (Table 4). Among those six methods five are post-slaughter and one is conducted on the live animal.

The use of the canonical analysis made it possible to evaluate, on the basis of the complex determination coefficient (C_R^2), to what extent the variables (traits determining the technological and culinary value of meat) explain the overall variability of the traits analysed. The degree of relationship between the given pair of canonical variable sets is shown by the coefficient of canonical correlation C_R [Zaremba *et al*., 1989; Koćwin-Podsiadła, 1993b; Koćwin-Podsiadła *et al*., 1988, 2002, 2003a, 2004a, 2005].

Initially, using the canonical analysis, a test was made of the value of the criteria accepted (pH_1, pH_{24}, R_1 and R_{24}) for diagnosing meat quality [Koćwin-Podsiadła, 1993b]. This analysis aimed at determining the traits and sets of traits which determine to the greatest extent the remaining meat quality properties. For the groups of porkers analysed the following sequence of traits determining the quality of raw meat was obtained: pH_1, R_1 and pH_{24}, which confirms the value of those criteria and the total uselessness of parameter R_{24} for diagnosing meat quality. The value of the parameters mentioned was verified on the basis of meat colour, drip loss, backfat thickness at cross point II, activity of enzymes LDH, CPK and WHC [Koćwin-Podsiadła & Chmura-Janowiak, 1987; Koćwin-Podsiadła *et al*., 1988, 1989; Chmura-Janowiak & Koćwin-Podsiadła, 1989; Koćwin-Podsiadła, 1993b]. The value and efficiency of the methods used for diagnosing meat classes was evaluated also on the basis of the properties and genetic background of the animals related to the frequency of blood haplotypes connected with the mutated gene of susceptibility to stress (known as the halothane linkage group) [Koćwin-Podsiadła & Kurył, 1990, 1992; Koćwin-Podsiadła, 1993b]. The verification of the efficiency of the method tested covered also an analysis of the quality of the ready product (canned ham) obtained from muscles qualified to different meat classes (PSE, partly PSE, normal and DFD) [Koćwin-Podsiadła, *et al*., 1989; Koćwin-Podsiadła, 1993b].

One should remember that meat obtained in the meat industry as result of cutting and dissection of carcasses is sold as fresh culinary meat or designated for the production of cured meats in a processing plant. The decision about designating the most valuable pork cuts for culinary or processed meat should be based on the results of quality parameter measurements, performed in the processing plant, *i.e*. on the slaughter line or in the cooler.

Taking into consideration the high production of pigs for slaughter and the high requirements of the consumer as regards the quality of fresh and processed meat [Carden, 2000; Dransfield, 2001] studies were undertaken in order to elaborate criteria determining the culinary and processing value of high quality pork, taking into consideration their proposed designation, which would be effective both for the meat processing plants and in selection work. It was demonstrated that electric conductivity measured 120 min after slaughter (EC_{120}) and acidity of the muscle tissue 24 h *post*

TABLE 4. Diagnostic methods of pork meat quality verified in own investigations.

Criterion of classification (independent variables)	Variables determining (dependent variables)	Coefficient of canonical correlation (C_R)	Respective squared canonical correlation (C_R^2)	Author and year
		Post mortem methods		
pH_1	L*, drip loss, activity of CPK, activity of LDH, WHC, fat thickness at II cross, estimation of ready made product preserved hams			Kortz *et al.* [1968]; Koćwin-Podsiadła [1993b]
pH_1, pH_{24}	L*, drip loss, activity of CPK, activity of LDH, WHC, fat thickness at II cross, estimation of ready made product preserved hams	0.641**	0.411	Pfeifer [1977]; Wirth [1984]; Koćwin-Podsiadła [1993b]
pH_1, R_1	L*, drip loss, activity of CPK, activity of LDH, WHC, fat thickness at II cross, estimation of ready made product preserved hams	0.647**	0.419	[1]Honikel & Fischer [1977]; Koćwin-Podsiadła [1993b] [2]Honikel & Fischer [1977]; Koćwin-Podsiadła & Chmura-Janowiak [1989]; Koćwin-Podsiadła [1993b] [3]Honikel & Fischer [1977]; Koćwin-Podsiadła *et al.* [1989]; Koćwin-Podsiadła [1993b]
EC_{120}, pH_{24}	Protein content, intramuscular content, RTN, WHC, drip loss	0.624*	0.390	Koćwin-Podsiadła *et al.* [2002, 2003a, 2004a, 2004b, 2005]
	Intramuscular content, tenderness meat, drip loss, lightness	0.770**	0.590	
Glycolytic potential and lactate	pH_1, pH_{24}, R_1, L*, WHC, RTN	0.952**	0.906	Przybylski *et al.* [2006]
		In vivo method		
Glycolytic potential and lactate	pH_1, pH_{24}, R_1, L*, WHC, RTN	0.806**	0.649	Przybylski *et al.* [2006]

[1]Marginal values for pH_1 and R_1 respectively 5.9 and 1.05, [2]Marginal values for pH_1 and R_1 respectively 6.0 and 1.05, [3] Marginal values for pH_1 and R_1 respectively 6.0 and 1.092; *significant at $p \leq 0.05$; ** significant at $p \leq 0.01$

TABLE 5. Criteria of the diagnosis of faulty meat and their marginal values [Koćwin-Podsiadła, 1993a, 1998; Koćwin-Podsiadła *el al.*, 1993, 1996, 1998, 2004b].

Class of meat quality	Method of diagnosis					
	pH_1R_1		pH_1pH_{24}		$EC_{120}pH_{24}$	
	pH_1	R_1	pH_1	pH_{24}	EC_{120}	pH_{24}
Normal	≥5.8	<1.05	≥5.8	5.5–6.0	≤4.5	5.5–6.0
Normal HQ	-	-	-	-	≤4.5	5.5–5.7
PSE	<5.8	≥1.05	<5.8	<5.5	>7.5	<5.5
Partly PSE	<5.8	<1.05	-	-	>4.5	<5.5
RFE	-	-	-	-	>4.5	5.5–5.7
Acid Meat	-	-	≥5.8	<5.5	≤4.5	<5.5
DFD	≥6.0	≥1.05	≥6.0	≥6.0	≤4.5	>6.0
Partly DFD	-	-	-	-	>4.5	>6.0

HQ high quality meat; R_1 – (IMP/ATP) measured in 45 min *post mortem*, EC_{120} – electrical conductivity of meat (mS/cm)

mortem (pH_{24}) are parameters which are possible to be measured in meat plants and which to a high degree determine the technological and culinary value of meat. The usefulness and efficiency of appointment criteria on the basis of culinary value and technological usefulness of meat, as: intramuscular fat content, total protein content, water holding capacity, drip loss, meat lightness, losses of meat in cooking, and the yield of cured meat in thermal processing have been verified [Koćwin-Podsiadła *et al*., 2002, 2003a, 2004a, 2005].

The criteria for classification of pork, verified over the years 1988–2004 are presented in Table 4.

The threshold values for criterion pH_1 and R_1, presented in Table 4, were accepted after Honikel & Fischer [1977]. Next they were verified and adapted to Polish requirements. The modification was performed in two stages [Koćwin-Podsiadła, 1993b]. In the first stage the outside values for pH_1 were verified and increased, while those for R_1 were retained unchanged. During the second stage, studies were conducted aiming at the determination of the outside values for R_1. The method of pork classification, modified in this way, rendered it possible to identify already 45 min *post mortem* four classes of meat: PSE, partly PSE, normal and DFD.

A comprehensive analysis of the quality properties of pork and its genetic conditioning conducted in the years 2002–2005 rendered it possible to elaborate criteria (EC_{120}, pH_{24}) identifying its culinary and processing value, as well as defining their outside values for selection in pedigree herds and for classification of meat quality for the meat processing industry [Koćwin-Podsiadła *et al.,* 2002, 2003a, 2004a, 2005].

For the criteria elaborated in such a way the threshold values were defined and verified based on width spectrum of the meat quality and its technological usefulness. The elaborated thresholds enabled identification of carcasses with meat of desired quality parameters and carcasses with acid (AM), exudative (PSE, RSE and RFE) or DFD meat (Table 5).

Moreover, taking into consideration the requirements of breeding work, a wide range of studies were conducted referring to the possibilities of diagnosing meat quality on the basis of DNA tests (RYR1, PRKAG-3, CAST/HinfI, CAST/MspI, CAST/RsaI, H-FABP/HaeIII, H-FABP/HinfI, H-FABP/MspI, MYOG) [Kurył *et al* 1994; Koćwin-Podsiadła *et al*., 1996, 2004b]. The obtained especially high dependency of basic fresh meat quality traits and its technological usefulness (pH_1, pH_{24}, R_1, L^*, WHC) on the intensity of glycolytic changes in muscle tissue (*i.e.* lactate level and glycolytic potential as *in vivo* and also *post mortem*) is the confirmation of the usefulness and the efficiency of diagnostic criteria of faulty meat (Table 4). One should remember that these traits are genetically conditioned – lactate level by RYR1 gene and glycolytic potential by RN^- gene, respectively [Koćwin-Podsiadła *et al.*, 1993, 2004 b,c; Kurył *et al,* 1994; Przybylski *et al.*, 1996].

The studies conducted indicate that when performing breeding work that aims at an improvement of the quality of

TABLE 6. Possibility of utilisation and genetic background of proposed methods of diagnosis of pork meat quality.

Method	Criteria	Influenced genes (*preferred genotype*)	Distinguished meat classes	Possibility of utilisation	
				In breeding	In meat industry
EC_{120}; pH_{24}	EC_{120} pH_{24}	RYR1 (*CC*), RN^-(*rn*$^+$*rn*$^+$), H-FABP/MspI (*AA*); PRKAG-3 (*GG*), RN^-(*rn*$^+$*rn*$^+$), CAST/HinfI (*AA*), CAST/MspI (*AA*), CAST/RsaI (*BB*)	N_{HQ}, PSE, partly PSE, DFD, partly DFD, AM, RFE	+	+
pH_1; R_1	pH_1 R_1	RYR1 (*CC*), CAST/RsaI (*BB*); RYR1 (*CC*),CAST/HinfI (*AA*), CAST/RsaI (*BB*), H-FABP/MspI (*Aa*)	N, PSE, partly PSE, DFD	+	-
pH_1; pH_{24}	pH_1 pH_{24}	RYR1 (*CC*), CAST/RsaI (*BB*); PRKAG-3 (*GG*), RN^-(*rn*$^+$*rn*$^+$), CAST/HinfI (*AA*), CAST/MspI (*AA*), CAST/RsaI (*BB*)	N, PSE,DFD, AM	+	+/-

N – normal meat, N_{HQ} – normal high quality meat; PSE – pale, soft, exudative; DFD – dark, firm, dry; AM – acid meat; RFE – reddish-pink, firm, exudative

pork, it is necessary to identify and take into consideration for mating animals the polymorphism of PRKAG-3 and RYR1 genes in herds burdened with the stress susceptibility gene, or PRAKAG-3, CAST and H-FABP genes in herds free of gene RYR1T. It was shown that for the criteria of meat evaluation proposed in Table 5, the pH_1 and R_1 values are determined by the polymorphism of gene RYR1, while the value of pH_{24} is significantly affected by the polymorphism of gene PRKAG-3 and CAST. In turn, the value of EC_{120} is significantly related to the polymorphism of RYR1 and H-FABP genes [Koćwin-Podsiadła *et al*., 1996, 2004b].

CONCLUSIONS

Summarising, on the basis of a wide range of studies one may state that special attention should be paid to three of the five post-slaughter methods of diagnosing the quality of pork. Those methods are based on the following criteria: pH_1, R_1, pH_1, pH_{24}; EC_{120}, pH_{24} (Table 6).

These parameters determine, to a high degree, other qualitative and technological properties of pork (C_R^2 in 0.419, 0.411, 0.390 and 0.590, respectively – Table 4). Those relations are interesting from a practical point of view, as the number of measurements performed on pig carcasses in meat industry plants or Polish Pig Testing Stations should be limited to a minimum. Each of these three methods may be used in breeding work (in conditions of Polish Pig Testing Stations). In turn, as the determination of the indicator of energy metabolism (R_1) is connected with a necessity to obtain meat samples from the carcasses and their preparation for measurement, classification methods based on the values obtained for pH_1 and pH_{24} as well as EC_{120} and pH_{24} are recommended for the meat industry.

The value and efficiency of the methods of diagnosing meat quality, presented herein, were tested on the basis of a numerous population of porkers. The accuracy, credibility and efficiency of the given outside values for criteria of pork classification were evaluated both from the point of view of the requirements of the meat industry and the breeding work. As regards the requirements of the meat industry this verification was based on the technological value of fresh meat and the quality of the final product.

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JAKOŚĆ WIEPRZOWINY I METODY JEJ DIAGNOZOWANIA – ARTYKUŁ PRZEGLĄDOWY

Maria Koćwin-Podsiadła[1], Elżbieta Krzęcio[1], Wiesław Przybylski[2]

[1]Akademia Podlaska, Siedlce; [2]Szkoła Główna Gospodarstwa Wiejskiego, Warszawa

Przedmiotem pracy jest zaprezentowanie podstawowych odchyleń w jakości wieprzowiny, przedstawienie przeglądu kryteriów i metod mających zastosowanie w diagnozowaniu jakości mięsa oraz ocena ich przydatności dla potrzeb praktyki hodowlanej i przemysłu mięsnego.

Na podstawie przeprowadzonych na przestrzeni lat 1988–2004 badań własnych (wykorzystujących analizę kanoniczną do oszacowania zależności między zbiorami cech – C_R) dopracowano, wyznaczając kryteria i wartości graniczne, i zweryfikowano trafność i skuteczność sześciu metod diagnozowania mięsa z odchyleniami jakościowymi opartych o obiektywne pomiary jego wybranych właściwości fizykochemicznych (5 metod poubojowych i jedna przyżyciowa).

Na szczególną uwagę zasługują trzy z pięciu zweryfikowanych poubojowych metod diagnozowania jakości mięsa wieprzowego oparte o kryteria: $pH_{1,}$ R_1 (C_R=0,647**); pH_1, pH_{24} (C_R=0,641**); EC_{120}, pH_{24} (C_R=0,624* dla cech przydatności technologicznej oraz C_R=0,770** dla cech jakości kulinarnej mięsa). Powyższe parametry w wysokim stopniu warunkują najważniejsze cechy jakości i przydatności technologicznej wieprzowiny (C_R^2 odp. 0,419; 0,411; 0,390 i 0,590). Są to zależności interesujące z praktycznego punktu widzenia, gdyż ilość pomiarów dokonywanych na tuszach wieprzowych w zakładach mięsnych powinna być ograniczona do minimum. Każda z tych trzech metod może mieć zastosowanie dla potrzeb pracy hodowlanej (z uwagi na udowodnione uwarunkowania genetyczne badanych kryteriów). Biorąc natomiast pod uwagę fakt, że oznaczenie poziomu wskaźnika przemian energetycznych (R_1) związane jest z koniecznością pobierania próbek mięsa z tusz i odpowiednim ich przygotowaniem do pomiaru, dla potrzeb przemysłu mięsnego zaleca się metody klasyfikacji oparte odp. o kryteria pH_1 i pH_{24} oraz EC_{120} i pH_{24}.