

## Veterinary meat inspection of pig carcasses in the Czech Republic during the period of 1995–2002

A. KOZAK<sup>1</sup>, V. VECEREK<sup>2</sup>, P. CHLOUPEK<sup>2</sup>, B. TREMLOVA<sup>2</sup>, M. MALENA<sup>3</sup>

<sup>1</sup>Veterinary Administration of the City of Prague, Czech Republic

<sup>2</sup>University of Veterinary and Pharmaceutical Sciences, Brno, Czech Republic

<sup>3</sup>State Veterinary Administration, Prague, Czech Republic

**ABSTRACT:** The results of meat inspection classification of pig carcasses reflect long-term aspects of health status in pig production farms and the quality of transport and handling of animals at slaughterhouses. Veterinary inspectors recorded the data obtained from meat inspection classification of 36 028 821 pig carcasses at slaughterhouses in the Czech Republic during the period of 1995–2002 together with the reasons for classification. The trends were evaluated by a comparison of two periods (Period I: 1995–1998; Period II: 1999–2002) by means of calculating the indexes of values from Period II compared to those of Period I. Pig carcasses classified as capable for human consumption (edible) were found in 97.28% of cases (97.26% during Period I and 97.31% during Period II, index 1.00), while those classified as capable for processing (conditionally edible) were found in 2.15% of cases (2.28% during Period I and 2.02% during Period II, index 0.89), and those condemned in 0.57% of cases (0.47% during Period I and 0.67% during Period II, index 1.43). The reasons for classifying the carcasses as condemned were as follows: sensorial changes in meat – 0.33% (0.26% during Period I and 0.41% during Period II, index 1.56), lesions due to non-infectious diseases – 0.12% (0.12% during Period I and 0.12% during Period II, index 0.97), added deleterious substances – 0.05% (0.03% during Period I and 0.07% during Period II, index 2.50), lesions due to respiratory infections – 0.03% (0.03% during Period I and 0.04% during Period II, index 1.70), boar taint – 0.02% (0.02% during Period I and 0.03% during Period II, index 1.36). Other reasons to condemn the carcasses included tuberculous lesions, lesions due to miscellaneous infections, digestive infections, parasitic diseases, and *Salmonella* infections. The occurrence of these conditions was on the level of mere hundredths of per cent. No case of Aujeszky's disease was found. According to the results of meat inspection classification, the risk of food-borne diseases originating from pig carcasses tends to be greater in the lesions due to non-infectious conditions with a long-term increasing trend. A considerable increase in the numbers of pig carcasses condemned due to added deleterious substances (index 2.50) is an alarming finding with regard to potential food safety hazards.

**Keywords:** food safety; zoonoses; risk assessment; pork meat

The results of meat inspection at slaughterhouses during the periods of several years with appropriate trends indicate possible risks due to unsafe meat obtained from pig carcasses at slaughterhouses. Such risks are eliminated by strict veterinary inspection of animals prior to slaughter, as well as of meat and organs after slaughter. A specification of slaughterhouse findings and expression of trends in different areas may indicate increased risks with regard to certain aspects of food-borne diseases

originating from meat and organs of slaughter pigs. Kofer *et al.* (2001) presented the importance of collection of data on pathological lesions detected during meat inspection at slaughterhouses. Berns *et al.* (1997) emphasised the importance of data obtained during meat inspection at slaughterhouses for the development of a system for pork quality improvement. Long-term trends detected in slaughterhouse findings are important indicators to support the measures for food safety improvement in

the products originating from meat and organs of slaughter pigs.

Lis (1999) presented slaughterhouse findings and their evaluation in Poland. Pathological lesions were found in 21.21% of pigs slaughtered in 1987. Furthermore, Lis (1998) evaluated the findings in more than 14 million pigs slaughtered in 1994. Pathological finding was reported in 36.57% of animals. The carcasses of 0.64% of animals were classified as incapable for human consumption, low-grade and conditionally capable for use. Later on, Lis (1999) reported pathological findings in 41.43% of pigs slaughtered in 1997.

Kozak *et al.* (2002) evaluated the results of slaughterhouse carcass classification into the categories of capable for human consumption, capable for processing and condemned in selected species of food animals at slaughterhouses in the Czech Republic. During the period of 1989–1994 there were 95.13% of pig carcasses classified as capable for human consumption, while during the period of 1995–2000 the figure for the same parameter was 97.27%. Furthermore the authors reported reduced numbers of pig carcasses classified as capable for processing from 3.95% to 2.20%, as well as reduced numbers of condemned pig carcasses from 0.92% to 0.53%. The improvements were explained by a generally better health status in slaughtered pigs.

Szazados (1992) examined cases of insufficient bleeding of pigs during emergency slaughters and subsequent meat inspection classification results. The following causes of insufficient bleeding were identified: acute cardiac insufficiency due to pig stress syndrome, pneumonia, pleuritis and pericarditis.

Kofer *et al.* (2001) analysed the findings from eight selected slaughterhouse operations from years 1999 and 2000. The inspection of slaughter pigs revealed pneumonia of different severity in 43.7% of animals, chronic pleuritis in 22.7%, chronic pericarditis in 6.8%, and milk spots in liver in 45.6% of cases.

Schuh *et al.* (2000) studied the findings in pigs slaughtered in Styria (Austria). The following results were presented: pneumonia found in 83.3%, pleuritis in 26.3%, pericarditis in 2.6% and milk spots in liver in 47.5% of slaughtered pigs.

The findings from the inspection of pig carcasses at six large slaughterhouse operations in Switzerland were published by Grest *et al.* (1997). The authors observed the findings in lungs of 8 921 slaughtered pigs. The most frequent cases

were bronchopneumonia (21%) and diffuse pleuritis (21%).

During the previous decade in the Czech Republic few papers were published about the analysis of the results of veterinary-hygiene inspection in slaughtered cattle and pigs (Pavlik *et al.*, 2002, 2003; Vecerek *et al.*, 2003).

This work was focused on the results of pig carcass classification within the process of meat inspection in slaughter pigs with the aim to compare the figures from two periods: Period I (1995–1998) and Period II (1999–2002). The classification into the categories of capable for human consumption, capable for processing and condemned was studied and the respective trends were evaluated. The reasons for the classification were summarised. Finally based on the data obtained this way the potential risk of food-borne diseases originating from pig carcasses was assessed.

## MATERIAL AND METHODS

During the studied period of 1995–2002 veterinary inspectors recorded total numbers of pigs slaughtered at slaughterhouses in the Czech Republic and the numbers of pig carcasses classified as edible, conditionally edible and condemned.

The classification “edible” means that pig carcasses were obtained in accordance with veterinary requirements for the production of safe meat and organs. The classification “conditionally edible” means that after special processing pig carcasses fulfil the veterinary requirements for the production of safe meat and organs. The classification “condemned” means that even after special treatment pig carcasses do not fulfil veterinary requirements for the production of safe meat and organs (e.g. because of a high content of pathogens posing a risk for human health, lesions making the carcasses unsuitable for human consumption, sensorial changes and unknown origin). In cases of pig carcasses classified as conditionally edible and condemned veterinary inspectors recorded numbers of cases caused by changes due to respiratory infections, changes due to digestive infections, tuberculous lesions, Aujeszky’s disease, changes due to Salmonella infection, changes due to miscellaneous infectious diseases, parasitic diseases, added deleterious substances, changes due to non-infectious diseases, changes in sensorial parameters and boar taint, respectively. The

results of laboratory examinations of samples from the carcasses and corresponding organs were also included in total evaluation. The samples were collected by veterinary inspectors.

The results of the evaluation of slaughter pigs were recorded and entered in a computer database. Central data processing took place at the Information Centre of the State Veterinary Administration. The following parameters were used for the present work: total numbers of pigs slaughtered, numbers of carcasses classified as edible and conditionally edible (in total and by different findings) as well as condemned (also in total and by different findings for the whole monitoring period 1995–2002). A trend in the development of the situation was calculated for different pig carcass classifications and types of findings by separate evaluation of the Period I (1995–1998) in comparison to Period II (1999–2002). The comparison was carried out using a value calculated as a ratio of relative occurrences of the given finding from the Period II vs. Period I. This calculation produced an index, whose value for example greater than 1.00 indicated that the occurrence increased during the Period II compared to Period I.

Long-term trends in the development of findings in slaughtered pigs were derived from the index values. Since the monitoring took several years and the set of data is very large, the results can be very well used for the indication of qualitative and quantitative consumer risks originating from pork obtained at slaughterhouses.

The results were processed by statistical software Unistat (Unistat Statistical Package, Unistat Ltd.) using a module for the calculation of relative frequencies.

## RESULTS

Total number of pigs slaughtered during the period of 1995–2002 and recorded by veterinary inspectors at slaughterhouses was 36 028 821. There were 17 843 984 pigs slaughtered during Period I and 18 184 837 during Period II. The index is 1.02, which means that the numbers of slaughtered pigs were very stable in the long term.

In total 97.28% of slaughtered pigs were classified as edible (Table 1). The result could be considered very good, showing a good health status of the pigs slaughtered at slaughterhouses. The figures for Period I and Period II were 97.26% and 97.31%, respectively, which again confirmed that the good health status was occurring consistently over a long period of time.

Out of the total number of slaughtered pigs, 2.15% were classified as conditionally edible (Table 2). This classification applies to the carcasses which may be released from the slaughterhouse only after special treatment. However, after having fulfilled the stipulated veterinary conditions it is possible to utilise such carcasses using prescribed methods of processing. There were 2.28% of slaughtered pigs classified in this category during Period I and 2.02% during Period II. The index is 0.89, which means that a long-term decreasing trend was confirmed in the numbers of pig carcasses classified as conditionally edible.

Various reasons were recorded for the classification of pig carcasses as conditionally edible. Changes in sensorial properties of meat were most frequent in 1.09% of all cases, followed by lesions due to non-infectious diseases (0.57%), boar taint (0.21%), tuberculous lesions (0.14%), lesions due to

Table 1. Veterinary-hygiene evaluation of pig carcasses during the studied period

Slaughterhouse meat inspection classification	Period						II/I index
	1995–2002		I (1995–1998)		II (1999–2002)		
	No.	%	No.	%	No.	%	
Edible	35 049 937	97.28	17 354 283	97.26	17 695 654	97.31	1.00
Conditionally edible	773 003	2.15	406 030	2.28	366 973	2.02	0.89
Condemned	205 881	0.57	83 671	0.47	122 210	0.67	1.43
Total	36 028 821		17 843 984		18 184 837		

Table 2. Veterinary-hygiene evaluation of pig carcasses as conditionally edible

Slaughterhouse meat inspection classification	Period						II/I index
	1995–2002		I (1995–1998)		II (1999–2002)		
	No.	%	No.	%	No.	%	
Respiratory infections <sup>a</sup>	38 594	0.11	22 571	0.13	16 023	0.09	0.70
Digestive infections <sup>a</sup>	977	0.00	803	0.00	174	0.00	0.21
Tuberculous lesions	51 217	0.14	37 049	0.21	14 168	0.08	0.38
Aujeszky's disease <sup>a</sup>	0	0.00	0	0.00	0	0.00	1.00
Salmonella infection <sup>a</sup>	1 271	0.00	922	0.01	349	0.00	0.37
Miscellaneous infections <sup>a</sup>	6 368	0.02	3 862	0.02	2 506	0.01	0.64
Parasitic diseases <sup>a</sup>	1 497	0.00	799	0.00	698	0.00	0.86
Added deleterious substances	1 882	0.01	1 026	0.01	856	0.00	0.82
Non-infectious diseases <sup>a</sup>	204 268	0.57	108 611	0.61	95 657	0.53	0.86
Sensorial changes in meat	392 547	1.09	191 368	1.07	201 179	1.11	1.03
Boar taint	74 382	0.21	39 019	0.22	35 363	0.19	0.89
Total	773 003	2.15	406 030	2.28	366 973	2.02	0.89

<sup>a</sup>lesions due to different causal agents

Table 3. Veterinary-hygiene evaluation of pig carcasses as condemned

Slaughterhouse meat inspection classification	Period						II/I index
	1995–2002		I (1995–1998)		II (1999–2002)		
	No.	%	No.	%	No.	%	
Respiratory infections <sup>a</sup>	12 418	0.03	4 544	0.03	7 874	0.04	1.70
Digestive infections <sup>a</sup>	647	0.00	544	0.00	103	0.00	0.19
Tuberculous lesions	167	0.00	123	0.00	44	0.00	0.35
Aujeszky's disease <sup>a</sup>	0	0.00	0	0.00	0	0.00	1.00
Salmonella infection <sup>a</sup>	71	0.00	60	0.00	11	0.00	0.18
Miscellaneous infections <sup>a</sup>	4 170	0.01	2 209	0.01	1 961	0.01	0.87
Parasitic diseases <sup>a</sup>	107	0.00	87	0.00	20	0.00	0.23
Added deleterious substances	17 112	0.05	4 823	0.03	12 289	0.07	2.50
Non-infectious diseases <sup>a</sup>	42 365	0.12	21 331	0.12	21 034	0.12	0.97
Sensorial changes in meat	119 898	0.33	46 207	0.26	73 691	0.41	1.56
Boar taint	8 926	0.02	3 743	0.02	5 183	0.03	1.36
Total	205 881	0.57	83 671	0.47	122 210	0.67	1.43

<sup>a</sup>lesions due to different causal agents

respiratory infections (0.11%). A comparison of the occurrence of different conditions during Period I and Period II showed that the trend in the classification in this category due to the reasons mentioned above was decreasing in the long term. Other reasons for the classification of pig carcasses as conditionally edible were lesions due to miscellaneous infections, added deleterious substances, parasitic diseases, lesions due to Salmonella infections, and digestive infections. The occurrence of these conditions was on the level of mere hundredths of per cent. No findings suggesting Aujeszky's disease were detected and therefore no pig carcasses were classified as conditionally edible due to this condition (Table 2).

In total 0.57% of all carcasses were condemned, i.e. classified as failing to meet the veterinary conditions for the production of safe meat and organs (Table 3). There were 0.47% of all pig carcasses condemned during Period I and 0.67% during Period II. The index is 1.43, which suggests that in the long term the numbers of condemned pig carcasses are on the increase.

One of the reasons for the classification of pig carcasses as condemned were deviations in sensorial parameters of meat. This condition was found in 0.33% of cases. The comparison of the figures during Periods I and II (0.26% vs. 0.41%) resulted in the index value of 1.56, suggesting that in the long term there was an increase in the numbers of condemned pig carcasses due to this particular condition. Infectious diseases leading to condemnation of pig carcasses were found in 0.12% of cases. The same occurrence of this condition (0.12%) was found during both periods, which confirmed the fact that numbers of carcasses condemned due to this cause remained unchanged. Another reason for condemnation was the finding of added deleterious substances in 0.05% of cases. There were 0.03% of cases during Period I and 0.07% during Period II. The resulting index of 2.50 indicated that there was a considerable increase in this particular condition in the long term. Changes due to respiratory infections caused condemnation of pig carcasses in 0.03% of cases. During Period I there were 0.03% of cases found, compared to 0.04% during Period II. The resulting index of 1.70 showed that in the long term this reason for condemnation of pig carcasses is on the increase. The same trend applies for boar taint with 0.02% of cases in Period I and 0.03% in Period II, with resulting index 1.36. Other reasons to condemn the carcasses included tuberculous lesions,

lesions due to miscellaneous infectious diseases, digestive infections, parasitic diseases and Salmonella infection. The occurrence of these conditions was on the level of mere hundredths of per cent. No cases of Aujeszky's disease requiring condemnation of pig carcasses were found (Table 3).

## DISCUSSION

The results of meat inspection classification into the categories of edible, conditionally edible and condemned, together with the reasons for the classification, belong among the indicators of health status in the herds of slaughter pigs in the long term. They also indicate the quality of transport and handling of animals at slaughterhouses. It has to be noted, however, as it was presented by Fries (1994), that this parameter does not include mortality of animals on farms during fattening, and subsequently during transport and handling at slaughterhouses. The reasons for particular classification and quantitative description of findings over the period of several years are important for the specification of any possible measures at pig farms, during transport and handling, aiming to reduce the occurrence of pig carcasses classified as conditionally edible or condemned.

The results presented by Kofer *et al.* (2001), Schuh *et al.* (2000), and Grest *et al.* (1997) showed that different changes found within the framework of meat inspection at slaughterhouse were relatively frequent and occurred in the order of tens of per cent. A comparison of occurrence of pathological findings in slaughter pigs in years 1987, 1994 and 1997 (Lis, 1998, 1999) revealed an increasing trend, although the final classification of carcasses into the categories of unsuitable for human consumption, low-grade status and conditional classification was given by Lis (1998) in the figures in the order of tenths of per cent. The results of this work are in agreement with the previously mentioned author, because the number of condemned pig carcasses was 0.57% of all cases. The occurrence of pig carcasses classified as edible remained the same (index 1.00), while the numbers of conditionally edible carcasses were decreasing (index 0.89). The trend in condemned carcasses was however clearly increasing (index 1.43).

In the study of trends in the numbers of pig carcasses classified as edible, conditionally edible and condemned during the periods of 1989–1994 and

1995–2000, (Kozak *et al.*, 2002) found that the numbers of pig carcasses classified as edible increased, while the numbers of those classified as conditionally edible and condemned decreased. Our results for the Period I and Period II, however, showed that the trends in the classification changed, namely in the category of condemned pig carcasses, which numbers started to increase. The change could be attributed to the amendments in veterinary regulations, which have come into effect since 2000. An improved enforcement of veterinary regulations might have influenced the situation as well.

It can be concluded from the works published by Kofer *et al.* (2001), Schuh *et al.* (2000), and Grest *et al.* (1997) that the authors focused on pathological findings which are usually related to infectious diseases of pigs. The analysis of pathological findings related to changes due to non-infectious diseases of pigs and found during slaughterhouse meat inspection was carried out only in cases of emergency slaughters (Szazados, 1992). Compared to the results of this author, however, the ranking of the reasons for condemnation of pig carcasses was rather different in our study. The most frequent reason for condemnation consisted in sensorial changes in meat (0.33%), followed by changes due to non-infectious diseases (0.12%) and added deleterious substances (0.05%). Changes due to respiratory infections and boar taint were far less frequent (0.03% and 0.02%, respectively). Other findings occurred in the order of hundredths of per cent or were not detected at all.

More hazards that influence the capability of pig carcasses for human consumption are due to the causes of non-infectious origin than due to infectious diseases. The results of a long-term pattern analysis in this area would support this trend. The comparison of the reasons for condemnation of pig carcasses during the periods of 1995–1998 and 1999–2002 indicated that the occurrence of sensorial changes in meat were on the increase (index 1.56), the numbers of findings of changes due to non-infectious diseases remained on the same level (index 0.97), and the cases of changes due to respiratory infections (index 1.70) and boar taint (1.36) increased. At the same time it has to be noted that the occurrence of added deleterious substances increased considerably (index 2.50).

With regard to the frequency of findings at slaughterhouses it can be concluded that as regards food-borne diseases originating from meat and organs of slaughter pigs there are more inherent potential risks arising from the changes due to

non-infectious diseases than due to infections. The risk of food-borne diseases showed an increasing trend in the long term.

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*Corresponding Author*

MVDr. Antonin Kozak, PhD., Veterinary Administration of the City of Prague, Na Kozacce 3, 120 00 Praha 2, Czech Republic  
Tel. +420 222 513 281, fax +420 224 254 134, e-mail: [ovs.praha\\_mesto@icsvscr.cz](mailto:ovs.praha_mesto@icsvscr.cz)

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