

## Organs of slaughter pigs as a source of potential risk for human health in the Czech Republic during the years 1995–2002

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**ABSTRACT:** The level of risk for human health originating from organs of slaughter pigs was determined on the basis of carcass inspection classification at slaughterhouses in the Czech Republic during the period of 1995–2002. The following pig's organs were included in the study: the lungs, heart, liver, spleen, kidneys, stomach, and intestines. A potential level of risk relating to food safety of different organs was determined according to the numbers of the organs condemned by official veterinarians. At the same time total number of slaughtered animals was also considered. The trend of the development of potential risk was determined as an index equal to the ratio of the occurrence of condemned organs during the period of 1999–2002 to the same figures from the period of 1995–1998. The highest level of potential risk was found in porcine lungs (at the level of 66.30%) followed by kidneys (18.14%), liver (17.20%) and heart (5.15%). Increasing trend in the development of risk was found for the lungs (index 1.19), spleen (1.16) and heart (1.15). The trends were confirmed as highly significant ( $P < 0.01$ ). The results indicating high levels of potential risk for food safety and increasing trends in the aforementioned organs of pigs confirmed the importance of veterinary inspection at slaughterhouses and classification of organs of slaughter pigs by official veterinarians. This way the risks for food safety are eliminated.

**Keywords:** food safety; veterinary inspection; findings at slaughterhouses

Food safety is influenced by the level of risk of development of foodborne diseases in man. The level of risk inherent to raw materials of animal's origin is very important. Some foodstuffs are manufactured from raw materials consisting of organs of slaughter pigs. The determination of potential risk levels in different organs and of the trends in development of such risk is important with regard to the measures aimed at increasing the safety of food manufactured from the organs. It can be assumed that potential risk levels will vary in different organs. The determination of potential risk levels is also important from the point of view of possible preferences in consumption of different organs of slaughter pigs. Food safety can be thus improved.

The risk arising from the carcasses of pigs slaughtered at slaughterhouses was evaluated by Kozak *et al.* (2002, 2003). The authors studied the occurrence of pig carcasses classified as capable for human consumption (edible), capable for processing (conditionally edible) and condemned in the Czech Republic. The results showed that the trends in the classification changed, namely in the category of condemned pig carcasses, which number started to increase. The similar trends were found in the classification of condemned bovine carcasses and viscera (Vecerek *et al.*, 2003a,b). In the Czech Republic were published few papers about the analysis of tuberculous lesions in slaughtered cattle and pigs (Pavlik *et al.*, 2002, 2003).

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Slaughterhouse findings in Poland were analysed by Lis (1999). Pathological findings were detected in 21.21% of pigs slaughtered in 1987. In another work Lis (1998) studied findings in more than 14 million pigs slaughtered in 1994. In this group of animals pathological findings were detected in 36.57% of animals. Finally in pigs slaughtered in 1997 Lis (1999) reported pathological findings in 41.43% of animals.

The risk inherent to carcasses and organs of slaughter pigs needs not only be due to infectious or non-infectious diseases acquired on farm, during the transport or handling. It may also originate from a combination of factors including negative impacts of technology. Szazados (1992) studied the relations between insufficient bleeding of pigs during emergency slaughter at slaughterhouses and subsequent meat inspection classification results. Insufficient bleeding was caused by acute heart failure accompanying porcine stress syndrome and other conditions including pneumonia, pleuritis and pericarditis.

Grest *et al.* (1997) analysed results from the inspection of pigs at six large slaughterhouses in Switzerland. As regards the findings in the lungs in a group of 8 921 slaughtered pigs, the most frequent cases were bronchopneumonia (21%) and diffuse pleuritis (21%). Schuh *et al.* (2000) studied findings in pigs slaughtered in Styria (Austria). Pneumonia was detected in 83.3%, pleuritis in 26.3%, pericarditis in 2.6% and milk spots in the liver in 47.5% of animals. Kofer *et al.* (2001) studied findings in eight selected slaughterhouses in 1999 and 2000. Different stages of pneumonia were found in 43.7% of animals, chronic pleuritis in 22.7% and chronic pericarditis in 6.8%. Milk spots in the liver were detected in 45.6% of cases.

The aim of the present work was to determine the level of risk for human health inherent to different organs of pigs slaughtered at slaughterhouses and assess the trends of development of this potential risk.

## MATERIAL AND METHODS

A potential level of risk relating to food safety of different organs was determined according to the numbers of the organs condemned by official veterinarians. At the same time total number of slaughtered animals was also considered. The results of carcass inspection classification by official

veterinarians at slaughterhouses were summarised for the period of 1995–2002. The following porcine organs were included in the study: the lungs, heart, liver, spleen, kidneys, stomach, and intestines. The results of laboratory examinations of tissue samples collected by veterinary inspectors were also considered to specify the final reasons of condemnation. The periods of 1995–1998 and 1999–2002 were evaluated separately in order to allow the assessment of trends. Both periods were compared by means of an index calculated as a ratio of relative numbers of condemnations in 1999–2002 versus 1995–1998. The index greater than 1.00 suggests an increasing trend in the level of risk inherent to organs of slaughter pigs while the index equal to 1.00 confirms unchanging level of risk in the long term. Decreasing trend in the risk originating from porcine organs is indicated by values below 1.00. The results were processed by statistical software Unistat (Unistat Statistical Package, Unistat Ltd.), using a module for the calculation of relative frequencies.

## RESULTS

The levels of risk for food safety inherent to organs of slaughter pigs expressed as relative numbers of condemned porcine organs as well as the trends in the development of these figures expressed in the form of indexes describing an increase or decrease of the numbers of condemned porcine organs are summarised in Table 1.

It can be concluded from the results that the highest risk as regards food safety was found in the lungs (66.30%), followed by kidneys (18.14%) and liver (17.20%). Relatively lower risk was attributed to the factors inherent to porcine heart (5.15%), intestines (3.66%), spleen (2.91%) and stomach (2.65%).

The highest trend in the increase of potential level of risk for human health was found in porcine lungs (index 1.19), followed by spleen (1.16), and heart (1.15). In other organs, however, the trends were decreasing, as it was shown for porcine kidneys (index 0.99), liver (0.98), stomach (0.98), and intestines (0.97). The trends were confirmed as highly significant.

Therefore the results confirmed that the highest potential risk for food safety was inherent to the lungs, kidneys and livers. The strongest long-term trends to the increase of potential risk were found in porcine lungs, spleen, and heart.

Table 1. Veterinary hygiene evaluation of pig's organs as condemned

Pig's organs	1995–2002		I (1995–1998)		II (1999–2002)		II/I index
	No.	%	No.	%	No.	%	
Lungs	23 886 374	66.30	10 773 644	60.38	13 112 730	72.11	1.19**
Heart	1 854 734	5.15	852 174	4.78	1 002 560	5.51	1.15**
Liver	6 196 756	17.20	3 106 626	17.41	3 090 130	16.99	0.98**
Spleen	1 048 670	2.91	479 523	2.69	569 147	3.13	1.16**
Kidneys	6 535 372	18.14	3 248 524	18.21	3 286 848	18.07	0.99**
Stomach	955 788	2.65	478 796	2.68	476 992	2.62	0.98**
Intestines	1 319 168	3.66	661 765	3.71	657 403	3.62	0.97**
Total number of slaughtered pigs	36 028 821		17 843 984		18 184 837		

\*\*the differences between period I and II were statistically highly significant ( $P < 0.01$ )

## DISCUSSION

The results suggest that out of all organs monitored in slaughtered pigs the highest risk for food safety was found in porcine lungs. This finding corresponds to the results of Kofer *et al.* (2001) who reported the highest occurrence of pneumonia out of all results of slaughterhouse porcine carcass inspection. Likewise the results published by Kozak *et al.* (2002, 2003), Pavlik *et al.* (2002, 2003), Schuh *et al.* (2000), Grest *et al.* (1997) and Vecerek *et al.* (2003a,b), were in agreement with this pattern. Some of the findings indicating ongoing pneumonia may be nevertheless also related to insufficient bleeding, as it was suggested by Szazados (1992). Another group of organs with still relatively high level of risk consisted of the kidneys and liver. Kofer *et al.* (2001) and Schuh *et al.* (2000) presented the results which principally corresponded with our findings. Moreover both authors reported considerably higher frequencies of the findings compared to our results. The risk inherent to the heart was also noteworthy. Risk levels found by us were close to the figures published by Kofer *et al.* (2001) and Schuh *et al.* (2000).

Long-term trends in the development of potential risk for food safety inherent to different porcine organs were increasing for the lungs, kidneys and heart. A particularly negative trend was found in the lungs with the increase of up to 72.11% of porcine

lungs condemned at slaughterhouses. This finding corresponds to the figures from Poland as published in the works by Lis (1998, 1999). On the other hand there were also some positive findings of slightly decreasing trends in the numbers of condemned livers, kidneys, stomachs and intestines. It can be concluded that the levels of risk inherent to these organs are decreasing, as it was also supported by the results of Kozak *et al.* (2002) on the long-term decrease in the numbers of porcine carcasses condemned at slaughterhouses.

The results indicating high levels of potential risk for food safety inherent in particular to porcine lungs, kidneys and liver confirmed the importance of veterinary inspection at slaughterhouses and classification of organs of slaughter pigs by official veterinarians. This way the risks for food safety are eliminated. The levels of risk and the increasing trends especially in porcine lungs, spleen and heart require intensive measures aimed at the protection against any hazards that may originate from the organs of slaughter pigs.

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