

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

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**ABSTRACT:** The results of veterinary meat inspection classification of 4 000 372 bovine carcasses reflect long-term aspects of health status in cattle herds and the quality of transport and handling of animals at slaughterhouses. Veterinary inspectors recorded the data obtained from meat inspection classification of bovine 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, and Period II, 1999–2002) by means of calculating the indexes of values from Period II compared to those of Period I. Bovine carcasses classified as capable for human consumption (edible) were found in 87.87% of cases (88.83% during Period I and 86.58% during Period II, index 0.97), while those classified as capable for processing (conditionally edible) were found in 7.53% of cases (7.38% during Period I and 7.71% during Period II, index 1.04), and those condemned in 4.60% of cases (3.79% during Period I and 5.71% during Period II, index 1.51). The most important reason for classifying the carcasses as condemned was the finding of sensorial changes in meat, which occurred in 2.56% of cases (2.23% during Period I and 3.00% during Period II, index 1.35), followed by lesions due to non-infectious diseases – 1.00% (0.81% during Period I and 1.25% during Period II, index 1.53), added deleterious substances – 0.88% (0.60% during Period I and 1.27% during Period II, index 2.11), lesions due to respiratory infections – 0.03% (0.02% during Period I and 0.04% during Period II, index 1.74), and lesions due to miscellaneous infectious diseases – 0.10% (0.10% during Period I and 0.10% during Period II, index 1.05). Other reasons to condemn the carcasses included improper identification, lesions due to digestive infections, lesions due to tuberculosis, lesions due to paratuberculosis, lesions due to salmonellosis, leucosis and parasitic diseases. The occurrence of these conditions was on the level of mere hundredths of per cent. According to the results of meat inspection classification, the risk of food-borne diseases originating from bovine 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 bovine carcasses condemned because of lesions due to paratuberculosis (index 4.62) represents an alarming finding with regard to potential food safety hazards.

**Keywords:** risk assessment; zoonosis; meat inspection classification; cattle; cow; bull; heifer; Johne's disease; Crohn's disease

The results of meat inspection at slaughterhouses with appropriate trends indicate possible risks due to unsafe meat obtained from bovine carcasses at slaughterhouses. Such risks are eliminated by strict veterinary inspection of animals prior to slaughter, as well as of meat and parenchymatous organs after slaughter. A specification of slaughterhouse findings and expression of trends in different parameters may indicate in some areas increased risks

with regard to certain aspects of food-borne diseases originating from meat and organs of slaughter cattle, while in other areas the risks may be on the decrease. Long-term trends in the decision-making process in meat inspection classification may serve as an important indicator for the measures to increase food safety.

Veterinary inspectors classify bovine carcasses into the categories of capable for human consump-

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This paper was prepared as a part of Research Project of the Ministry of Education, Youth and Sports of the Czech Republic No. 16270005 "Research of current hygienic aspects of production of food and raw materials of animal origin with regard to their safety".

tion (edible), capable for processing (conditionally edible), and condemned. The classification includes the assessment of final condition at slaughterhouse, which reflects the quality of nutrition, husbandry, hygiene, breeding, health status, health care, transport, handling at slaughterhouse, goading, method of stunning and final slaughtering.

The classification of bovine carcasses is based on the results obtained from the inspection. Wyss (1996) described different components of the inspection – visual assessment, palpation, assessment of tissue in sections, as well as laboratory examinations of tissue samples, swab samples and impression smears.

Lis (1997, 1999) presented slaughterhouse findings and their evaluation in Poland. Pathological findings were found in 21.9% out of the total number of 1.7 million heads of cattle slaughtered in 1994 (Lis, 1997). The carcasses of 0.88% of animals were classified as incapable for human consumption, low-grade and conditionally capable for use. Later on, Lis (1999) compared the numbers of pathological findings in cattle at slaughterhouses in 1987 and 1997. Pathological findings were detected in 43.9% of cases of cattle slaughtered in 1987 and in 20.5% 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 77.14% of cow carcasses classified as capable for human consumption, while the figure for the same parameter was 79.48% for the period of 1995–2000. Numbers of heifer carcasses capable for human consumption equalled to 83.06% in 1989–1994 and 92.49% in 1995–2000, while in bulls the same classification was reported in 89.62% of cases in 1989–1994 and 95.52% in 1995–2000. The increased numbers of bovine carcasses classified as edible were attributed to an improved health status of slaughtered cattle. In the same study a considerable decrease in the occurrence of bovine carcasses classified as conditionally edible was found. The numbers of condemned carcasses of heifers and bulls were decreasing but in cows the same parameter was increasing, namely from 6.43% to 8.64%. This was attributed to stronger enforcement of amended veterinary regulations as well as the regulations against cruelty to animals.

Slaughterhouse findings were also studied by Julini (1993), who presented pathological find-

ings in cattle at slaughterhouses in Alessandria (Piedmont, Italy) in the period of 1980–1985. Most frequently detected findings in oxen were as follows: chronic bronchopneumonia, lesions due to tuberculosis, fasciolosis and pyelonephritis.

Mala and Baranova (1995) reported the detection of sarcocystosis in 1.7% of the total of 350 bovine carcasses from Slovakia.

Giaccone *et al.* (1994) studied the causes of liver condemnation in cattle at slaughterhouses in the area of Turin and Cuneo (Piedmont, Italy). Fasciolosis was the main reason for liver condemnation.

Kunst and Reuter (1994) studied the occurrence of haemorrhages in mesenteric lymphonodes in Germany. The authors noted that the examined intestines showed signs of acute or subacute diffuse catarrhal enteritis. In such case it is necessary to identify the relations to the primary disease which caused the haemorrhages.

Our work was focused on the results of bovine carcass classification within the process of meat inspection in slaughter cattle with the aim to compare the figures from two periods, namely 1995–1998 and 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 bovine meat and organs was assessed.

## MATERIAL AND METHODS

During the period of 1995–2002 veterinary inspectors recorded total numbers of cattle (excluding calves) slaughtered at slaughterhouses in the Czech Republic and the numbers of bovine carcasses classified as edible, conditionally edible and condemned.

The classification “edible” means that bovine carcasses were obtained in accordance with veterinary requirements for production of safe bovine meat and organs. The classification “conditionally edible” means that after special processing bovine carcasses fulfil the veterinary requirements for the production of safe meat and organs. The classification “condemned” means that even after special treatment bovine 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, unknown origin). In cases of bovine carcasses classified as conditionally edible and condemned veterinary inspectors recorded numbers of lesions due to: respiratory and digestive infections, tuberculosis, paratuberculosis, salmonellosis, leucosis, other infectious, parasitic and non-infectious, added deleterious substances, changes in sensorial parameters and improper identification. 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 cattle 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 cattle 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 bovine carcass classifications and types of findings by separate evaluation of the period 1995–1998 in comparison to 1999–2002. The comparison was carried out using a value calculated as a ratio of relative occurrences of the given finding from the periods of 1999–2002 vs. 1995–1998. This calculation produced an index, whose value greater than 1.00 indicated that the occurrence increased during the second period (1999–2002) compared to the first one (1995–1998). The index value of 1.00 meant that the occurrence of findings did not increase, and the value below 1.00 indicated a decrease in numbers of findings

during the second period of 1999–2002 compared to the first one (1995–1998).

Long-term trends in the development of findings in slaughtered cattle 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 beef obtained at slaughterhouses.

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

## RESULTS

Total number of cattle slaughtered during the period of 1995–2002 and recorded by veterinary inspectors at slaughterhouses was 4 000 372. There were 2 304 288 heads of cattle slaughtered during Period I (1995–1998) and 1 696 084 during Period II (1999–2002). The index was 0.74, which means that the numbers of slaughtered cattle considerably decreased (Table 1).

In total 87.87% of slaughtered cattle were classified as edible (Table 1). This meant that the frequency of findings in cattle at slaughterhouses is relatively high. In total more than 12.13% of slaughtered cattle showed some defects making it impossible for the veterinary inspectors to classify the carcasses as edible. The percentages of edible carcasses for Period I and Period II were 88.83% and 86.58%, respectively. The index of 0.97 suggests a slight decrease in the percentage of bovine carcasses classified as edible in the long term.

Tables 1 and 2 contain summary figures for the bovine carcasses classified as conditionally edible. Out of the total number of slaughtered cattle, 7.53% were classified as conditionally edible. There were

Table 1. Veterinary meat inspection of bovine carcasses during the studied period

Slaughterhouse meat inspection classification	1995–2002		Period I (1995–1998)		Period II (1999–2002)		II/I index
	No.	%	No.	%	No.	%	
Edible	3 515 195	87.87	2 046 795	88.83	1 468 400	86.58	0.97
Conditionally edible	301 034	7.53	170 176	7.38	130 858	7.71	1.04
Condemned	184 143	4.60	87 317	3.79	96 826	5.71	1.51
Total	4 000 372	100	2 304 288	100	1 696 084	100	

Table 2. Veterinary meat inspection of bovine carcasses as conditionally edible

Slaughterhouse meat inspection classification	1995–2002		Period I (1995–1998)		Period II (1999–2002)		II/I index
	No.	%	No.	%	No.	%	
Respiratory infections <sup>a</sup>	2 006	0.05	990	0.04	1 016	0.06	1.39
Digestive infection <sup>a</sup>	75	0.00	56	0.00	19	0.00	0.46
Tuberculosis <sup>a</sup>	898	0.02	656	0.03	242	0.01	0.50
Paratuberculosis <sup>a</sup>	643	0.02	204	0.01	439	0.03	2.92
Salmonellosis <sup>a</sup>	3	0.00	2	0.00	1	0.00	0.68
Leucosis <sup>a</sup>	33	0.00	32	0.00	1	0.00	0.04
Miscellaneous infections <sup>a</sup>	5 418	0.14	3 148	0.14	2 270	0.13	0.98
Parasitic diseases <sup>a</sup>	14 675	0.37	11 500	0.50	3 175	0.19	0.38
Sensorial changes in meat	185 565	4.64	105 142	4.56	80 423	4.74	1.04
Added deleterious substances	1 522	0.04	1 204	0.05	318	0.02	0.36
Non-infectious diseases <sup>a</sup>	90 196	2.25	47 242	2.05	42 954	2.53	1.24
Improper identification	0	0.00	0	0.00	0	0.00	–
Total	301 034	7.53	170 176	7.38	130 858	7.71	1.04

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

7.38% of slaughtered cattle classified in this category during Period I and 7.71% during Period II. The index was 1.04, which means a slight increase in the percentage of bovine carcasses classified as conditionally edible in the long term.

Various reasons were recorded for the classification of bovine carcasses as conditionally edible (Table 2). Changes in sensorial properties of meat were most frequent in 4.64% of all cases, followed by lesions due to non-infectious diseases (2.25%), parasitic diseases (0.37%), lesions due to miscellaneous infectious diseases (0.14%) and lesions due to respiratory infections (0.05%). 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 increasing in the long term, in particular in lesions due to non-infectious diseases. Other reasons for the classification of bovine carcasses as conditionally edible were added deleterious substances, lesions due to digestive infections, leucosis and lesions due to salmonellosis. The occurrence of these conditions was on the level of mere hundredths of per cent. Lesions due to tuberculosis belonged among special findings

with a strongly decreasing trend (index 0.50). Cases of lesions due to paratuberculosis were considered very important, especially with regard to their increasing occurrence (index 2.92).

Tables 1 and 3 contains summary figures for the bovine carcasses classified as condemned. In total 4.60% of all carcasses were condemned, i.e. classified as failing to meet the veterinary conditions for the production of safe meat and organs and not capable to be released for further processing. There were 3.79% of all bovine carcasses condemned during Period I and 5.71% during Period II. The index was 1.51, which suggests that in the long term the numbers of condemned bovine carcasses are on the increase.

The most frequently detected condition leading to the condemnation of bovine carcasses was the deviation in sensorial parameters of meat (Table 3). This condition was found in 2.56% of cases. The comparison of the figures during Periods I and II (2.23% vs. 3.00%) resulted in the index value of 1.35, suggesting that in the long term there was an increase in the numbers of condemned bovine carcasses due to this particular condition. Lesions due to non-infectious diseases leading to condem-

Table 3. Veterinary meat inspection of bovine carcasses as condemned

Slaughterhouse meat inspection classification	1995–2002		Period I (1995–1998)		Period II (1999–2002)		II/I index
	No.	%	No.	%	No.	%	
Respiratory infections <sup>a</sup>	1 159	0.03	508	0.02	651	0.04	1.74
Digestive infections <sup>a</sup>	143	0.00	75	0.00	68	0.00	1.23
Tuberculosis <sup>a</sup>	8	0.00	6	0.00	2	0.00	0.45
Paratuberculosis <sup>a</sup>	396	0.01	90	0.00	306	0.02	4.62
Salmonellosis <sup>a</sup>	30	0.00	27	0.00	3	0.00	0.15
Leucosis <sup>a</sup>	13	0.00	10	0.00	3	0.00	0.41
Miscellaneous infections <sup>a</sup>	4 069	0.10	2 292	0.10	1 777	0.10	1.05
Parasitic diseases <sup>a</sup>	486	0.01	313	0.01	173	0.01	0.75
Sensorial changes in meat	102 325	2.56	51 413	2.23	50 912	3.00	1.35
Added deleterious substances	35 338	0.88	13 835	0.60	21 503	1.27	2.11
Non-infectious diseases <sup>a</sup>	39 897	1.00	18 748	0.81	21 149	1.25	1.53
Improper identification	279	0.01	0	0.00	279	0.02	increase
Total	184 143	4.60	87 317	3.79	96 826	5.71	1.51

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

nation of bovine carcasses were found in 1.00% of cases. There were 0.81% of cases during Period I and 1.25% during Period II. The resulting index of 1.53 indicated that there was an increase in this particular condition in the long term. Another reason for condemnation were added deleterious substances in 0.88% of cases (0.60% during Period I and 1.27% during Period II). The resulting index of 2.11 again showed a considerable long-term increase in the occurrence of this finding. Lesions due to miscellaneous infectious diseases caused condemnation of bovine carcasses in 0.10% of cases. The same occurrence of this condition (0.10%) was found during both periods, which confirmed the fact that numbers of carcasses condemned due to this cause remained unchanged. Lesions due to respiratory infections were found in 0.03% of cases (0.02% during Period I and 0.04% during Period II). The resulting index of 1.74 showed a long-term increase in the occurrence of this finding. The condemnation due to lesions due to paratuberculosis was considered particularly noteworthy due to its considerably increasing trend reflected by index value of 4.62. Other reasons to condemn the carcasses included improper identification, lesions due to digestive infections, tuberculosis, parasitic diseases, salmonellosis and leucosis.

The occurrence of these conditions was on the level of mere hundredths of per cent.

## 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 cattle herds 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 on farms, during transport and handling, aiming to reduce the occurrence of bovine carcasses classified as conditionally edible or condemned.

The studies of Lis (1997, 1999) contain a comparison of the occurrence of pathological findings in cat-

tle at slaughterhouses in 1987, 1994 and 1997, as well as the presentation of trends. Lis (1997) reported that the proportion of carcasses classified into the categories of unsuitable for human consumption, low-grade status and conditional classification was around 1%. The figures in our work were considerably higher and reached to 4.60%. Moreover, the trends found in our work are opposite to those suggested by Lis (1997, 1999). According to our results the occurrence of bovine carcasses classified as edible was slightly decreasing (index 0.97) while in conditionally edible carcasses there was an opposite trend (index 1.04). The numbers of condemned carcasses were increasing more considerably (index 1.51). The results published by Kozak *et al.* (2002) indicated a decrease in the occurrence of condemned carcasses of heifers and bulls and on the contrary an increase in the occurrence of condemned carcasses of cows. Our results indicated an increase in the occurrence of condemned bovine carcasses in total, in particular during recent years. The difference could be attributed to a stricter veterinary slaughterhouse inspection in cattle in the Czech Republic due to the change of legal regulations effective since 2000.

It can be concluded from the works by Julini (1993), Mala and Baranova (1995), Giaccone *et al.* (1994), and Kunst and Reuter (1994) that the authors focused on pathological findings which are usually related to parasitic and infectious diseases of cattle. Our results however suggested a different ranking of reasons for the meat inspection classification of bovine carcasses. In this work the most important reasons preventing veterinary inspectors to classify the carcasses as edible were sensorial changes in meat (2.56%), lesions due to non-infectious diseases (1.00%) and added deleterious substances (0.88%). Lesions due to miscellaneous infectious diseases and respiratory infections were far less frequent (0.10% and 0.03%, respectively). Other findings occurred in the order of hundredths of per cent only.

More hazards that influence the capability of bovine 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 bovine carcasses during the periods of 1995–1998 and 1999–2002 indicated that the occurrence of sensorial changes in meat are on the increase (index 1.35) as well as the occurrence of lesions due to non-infectious diseases (index 1.53). Numbers of cases when added deleterious substances were detected

increased rather considerably (index 2.11). There were also more cases of improper identification. On the other hand, there was a decreasing trend detected for the cases of parasitic diseases (index 0.75), salmonellosis (index 0.15) and leucosis (index 0.41). The same decreasing trend was found for the cases of tuberculosis (0.45) due to the control of bovine tuberculosis in cattle and other animal in the Czech Republic in 1968 and the following low incidence in the studied period (Pavlik *et al.*, 2002a–d, 2003). A slightly increasing trend in cases of condemnation was recorded for the cases of lesions due to miscellaneous infectious diseases (index 1.05). There were markedly more cases of lesions due to respiratory infections (index 1.74), as well as more cases of lesions due to digestive infections (index 1.23).

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 cattle there are more inherent potential risks arising from the lesions due to non-infectious diseases than due to infections. The risk of food-borne diseases showed an increasing trend in the long term. Considerable increase in the numbers of cases when bovine carcasses were condemned because of lesions due to paratuberculosis (index 4.62) is alarming. This disease may become a serious problem, as it can be concluded from the papers by Pavlik *et al.* (2000), Ayele *et al.* (2001), and Fischer *et al.* (2001).

## Acknowledgements

The authors acknowledge the assistance of Prof. MVDr. Karel Hruska, CSc., who has significantly contributed with his advice and information to successful finalisation of this work.

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Received: 03–03–12

Accepted after corrections: 03–05–20

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