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## ANALYSIS OF THE FREQUENCY OF CHANGES AND DISEASE SYMPTOMS IN CATTLE AND PIGS IN POLAND BASED ON THE SANITARY AND VETERINARY INSPECTION RESULTS IN 2019

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**Abstract.** Lesions or signs of disease found before and after slaughter provide information about the health and well-being of the animals. The testing of slaughter animals and meat is a tool to reduce the risks to the safety and health of consumers and should be carried out systematically. The aim of the study was to analyze the results of post-mortem inspection of pigs and cattle in Poland in 2019. The data from the sanitary and veterinary examination taken from the annual reports prepared by the Chief Veterinary Inspectorate in 2019 were analysed. In the assessment of the causes of lesions and unfitness for consumption, the following diseases were taken into account: tuberculosis, actinomycosis, as well as qualitative deviations: emaciation and watery muscles, icterus, organoleptic changes, incomplete loss of blood, natural death, slaughter in agony, pus foci, contamination and congestion, as well as other changes and parasitic invasions: cysticercosis, echinococcosis, fasciolosis and trichinellosis. The collected material was compiled according to the frequency of pathological changes found in the sanitary-veterinary examination of pigs and cattle in individual provinces in Poland, and then their percentage structure was determined. In 2019, veterinary supervision covered over 1.9 million cattle and over 21.5 million pigs. During the ante-mortem and post-slaughter inspection, diseases or lesions were found in over 7.3 million animals, i.e. 31.4% of the examined slaughter animals. The percentage of carcasses unfit for consumption in cattle was 0.22%, and in pigs it was 0.14%. Among the lesions registered in pigs and cattle, the most numerous group consisted of foci of pus, contamination and congestion – 22.4 and 8.51%, respectively. The presence of foci of pus, contamination and congestion in pig and cattle carcasses was found in all voivodeships. The highest percentage of these changes in cattle carcasses was recorded in the following voivodeships: Kujawsko-Pomorskie (50.71%), Podlaskie (19.29%) and Zachodniopomorskie (11.74%). In all voivodeships, foci of pus, congestion and contamination in pig carcasses were also found. In the Lubuskie voivodeship, such changes were registered in over 90% of the examined pig carcasses, and in the Podlaskie and Kujawsko-Pomorskie voivodeships in over 49% of the examined pig carcasses. In 2019, the number of animals for slaughter showing abnormal health status or symptoms and lesions remained high in Poland. A large number of congestion and contamination proves insufficient care for the conditions of slaughter animals, as well as for hygiene and conditions for slaughtering and carcass cutting and processing.

**Key words:** slaughtered animals, post-mortem inspection, disease symptoms.

## **INTRODUCTION**

Ensuring health food of animals origin requires monitoring the entire production chain, especially pre- and post-slaughter testing of slaughter animals. One of the measures for assessing the health of animals is to evaluate their post-slaughter outcomes (Sánchez et al. 2018). Over the last years, a number of reports have been published regarding the evaluation of slaughter animals in Poland, meat evaluation, poultry meat and free-ranging animals (Górski and Kondracki 2019, 2020; Górski et al. 2021; Górski 2022). Thus, it seems expedient to make an assessment of the slaughter animal and meat inspection results for Poland in 2019.

The meat industry is the largest part of Poland's food industry, and producers of meat and processed meat products have a significant position in the country's trade turnover (Drożdż 2018). The consumption of meat to 72.8 kg per capita in Poland amounted. Pork consumption amounted to 40.3 kg and beef consumption remaining low at 4.1 kg per person per year (GUS 2020). In 2009, meat consumption was 70.8 kg per capita, including pork – 42.4 kg, poultry – 24 kg and beef – 3.6 kg (Lis and Górski 2011; Lis and Iwanina 2011; Michalska et al. 2013).

The safety of processed meat products depends on the healthiness of the slaughter livestock. The quality of carcasses and meat is also affected by rearing technology, as well as transport and preslaughter conditions of the animals (Jaja et al. 2018). Illnesses are most often attributed to nutritional mistakes and improper hygienic conditions of animals and premises. Because of that, there is increasingly greater attention paid to optimizing animal handling during pre-slaughter turnover (Nielsen 2011; Knock and Carroll 2019).

Changes or symptoms observed before and after the slaughter of animals shall provide information on the health status and welfare of the animals. As a result, research in this area should be conducted systematically (Hansson et al. 2000; Kozák et al. 2002). Slaughter animal and meat inspection constitutes a tool for reducing or even ruling out safety and health risks for consumers. Animal infections with no recognizable clinical signs during rearing or fattening, as well as before and slaughter, remain a major problem (Dalmau et al. 2014; Alpigiani et al. 2017; Staaveren et al. 2017).

## **MATERIAL AND METHODS**

Sanitary and veterinary examination data taken from annual reports compiled by the Chief Veterinary Inspectorate (RRW-6) in 2019 were analyzed. The post-mortem examination included visual inspection of carcasses and organs. Pathological lesions were established and recorded through palpation and incision of suspicious organs. Causes of lesions and unsuitability of slaughter animal carcasses were also analyzed. The evaluation of lesion causes and unfitness for consumption included diseases such as: tuberculosis, actinomycosis and sepsis, as well as qualitative deviations: emaciation and watery muscles, icterus, organoleptic changes, incomplete blood loss, natural death, slaughter in agony, foci of pus, contamination and congestion and other lesions, and parasitic invasions: cysticercosis, echinococcosis, fasciolosis and trichinellosis.

The analysis of the results included the number of animals tested, the number of carcasses found to be diseased and the number of carcasses declared unfit for consumption. The incidence of lesions and diseases was calculated by dividing the number of lesions by the number of test animals of a given species. The collected specimens were compared in terms of the frequency of pathological changes found in the sanitary and veterinary examina-

tion of cattle and pigs in specific voivodeships in Poland in 2019, and then their percentage structure was determined. Changes in the incidence of pathological conditions and lesions in slaughter animals in 2019 were also analyzed.

## RESULTS AND DISCUSSION

Data in Table 1 show that more than 23.46 million slaughtered animals in 2019 were placed under veterinary supervision, including more than 1.94 million cattle and more than 21.5 million pigs.

Table 1. Frequency of pathological conditions and lesions in animals slaughtered in Poland in 2019

Species	Number of examined animals	Number and percentage of animals with lesions or pathological symptoms	Number and percentage of carcasses unfit for consumption
Cattle	1 948 322	360 467 (18.50)	4 289 (0.22)
Pigs	21 513 924	7 021 325 (32.63)	30 407 (0.14)
Total	23 462 246	7 381 792 (31.46)	34 696 (0.14)

Compared to 2018, the number of pigs tested decreased by 1.2 million, and the number of cattle decreased by 40 thousands (Górski 2020). There were 18.50% of animals with symptoms or lesions among cattle in 2019. In pigs, the percentage of animals showing lesions exceeded 32.63%. Compared to 2009 (Lis and Górski 2011; Lis and Iwanina 2011), the number of slaughter animals tested increased by more than 4 million in 2019.

In 2018, there was 21.59% of cattle and 32.60% of pigs with symptoms or lesions (Górski 2020). In 2019, 34.69 thousand carcasses were declared unfit. The percentage of unfit carcasses in cattle was 0.22%, with 0.14% in pigs, and was slightly lower in 2019 than in 2018. Comparing these data with the 2009 slaughter animal survey, it should be noted that the percentage of pigs showing lesions decreased by 6.66%. In case of cattle, the decrease in the percentage of animals with lesions was smaller, at 1.07%. The percentage of unfit carcasses ranged from 0.14% in pigs to 0.22% in cattle and was slightly lower in 2019 than in 2009 (Lis and Górski 2011; Lis and Iwanina 2011).

The Table 2 summarizes data showing the frequency of lesions in different species of slaughter animals in 2019 by type of lesion.

The data shows that cases of tuberculosis, actinomycosis, emaciation and watery muscles, icterus, neoplasms, putrefaction, chemical poisonings, organoleptic changes, incomplete loss of blood, natural death, the finishing stroke in agony, pus foci, contamination and congestions and cysticercosis were diagnosed in both cattle and pigs. There were other parasites and other changes in the carcasses of all these species. Cases of erysipeloid, trichinellosis and sarcocystosis have been reported in pigs, and cases of fasciolosis and leukemia have been reported in cattle.

The Table 2 data shows that the largest group were the animals with pus foci, contamination and congestion – 8.51% in cattle and 22.49% in pigs respectively. The reason for the occurrence of such lesions may be due to improper handling of slaughter animals during transport, as well as before slaughter (Bueno et al. 2013). A large number of contamina-

tions and congestions may indicate poor hygienic quality during cutting and processing of carcasses (Jaja et al. 2018). Comparing the prevalence of lesions defined as pus foci, contamination and congestion with 2018 data, it can be seen that there was a decrease in the percentage of cattle with these lesions, from 12.70% to 8.51%. A similar trend was observed for pigs (down from 24.15% to 22.49%). Fasciolosis in cattle (5.96%) and other changes in pigs (7.16%) were the second most frequent. For comparison, the prevalence of fasciolosis in cattle in Poland was 6.69% in 2018 – a similar level compared to 2019 (Górski 2020).

Table 2. Frequency of pathological conditions in 2019 by type of conditions

Type of lesions	Cattle	Pigs
	number and percentage	
Tuberculosis	33 (0.001)	212 (0.001)
Erysipeloid	–	1435 (0.006)
Other infectious diseases	0 (0.00)	350 (0.001)
Actinomycosis	1344 (0.06)	10328 (0.04)
Emaciation and watery muscles	241 (0.01)	2122 (0.01)
Icterus	99 (0.005)	2143 (0.01)
Leukemia	28 711 (1.47)	–
Neoplasms	6 (0.0003)	2 (0.00001)
Putrefaction	49 (0.002)	14 (0.0001)
Chemical poisonings	38 (0.002)	3445 (0.01)
Organoleptic changes	1041 (0.05)	6635 (0.03)
Incomplete loss of blood, natural death, the finishing stroke in agony	273 (0.01)	1776 (0.008)
Sarcocystosis	0 (0.00)	27 (0.0002)
Pus foci, contamination and congestions	165 894 (8.51)	4838882 (22.49)
Cysticercosis	529 (0.02)	16 (0.0001)
Echinococcosis	0 (0.00)	15959 (0.07)
Fasciolosis	116278 (5.96)	–
Trichinellosis	–	29 (0.0002)
Other parasites	1184 (0.06)	595872 (2.76)
Other changes	44747 (2.29)	1542078 (7.16)
Total	360 467 (18.50)	7 021325 (32.63)

Fasciolosis in cattle occurs en masse in the second half of July in Poland. This is conditioned by the numerous emergence of snails and the period of larval fluke development to the invasive stage. Wet or only periodically soggy pastures are the main source of invasion. Soggy fresh hay harvested from meadows for cattle grazing can also be a source of infestation (Kowalczyk et al. 2018). Liver lesions visible on post-mortem examination in cattle appear about 20 weeks after infection. Heavy liver fluke infestation causes significant economic losses (Lis and Górski 2011). Strictly determining the size of these losses

is extremely difficult, and it is almost impossible to fully quantify them. This consists of a number of causes resulting from the parasite's complex biological life cycle on the one hand, and complex pathogenic effects on the host organism on the other. It is assumed that most of these losses result directly from pathological changes, and the rest are indirect consequences of the parasite's activity (Ahmad et al. 2017). The abundant population of roe-deer, one of the host's for flukes, is also a factor conducive to fasciolosis spread (Kornaś et al. 2005; Filip-Hutsch et al. 2022).

Other lesions occurred with much lower frequency. Tuberculosis lesions were present in 0.001% of cattle and pigs tested, emaciation and watery muscles in 0.01% of cattle and pigs, incomplete loss of blood, natural death, the finishing stroke in agony occurred in 0.01% of cattle and 0.008% of pigs. Other disease entities or quality deviations in cattle and pig carcasses accounted for between 0.00001% and 7.16%. The fact that the number of trichinellosis cases in pig meat is decreasing – 29 cases in 2019 – is favourable. Forty cases of the disease were found in the entire Poland in 2018 (Górski 2020). The decreasing percentage of pigs with echinococcosis is to be considered as satisfactory. The condition was recorded in pigs at 0.07% in 2019, compared to 0.09% in 2018.

Comparing the frequency of symptoms and lesions with 2009 data, it can be seen that there was an increase in the percentage of animals diagnosed with tuberculosis in cattle (from 0.0001% to 0.001%). Reductions were observed in the extensiveness of fasciolosis in cattle (from 9.54% to 5.96%). The item "other parasites" in cattle and pigs showed a decrease in percentage. The percentage of pigs with symptoms recorded as pus foci, contamination and congestion also decreased (from 32.0% to 22.49%, respectively). In the case of cattle, a slight increase was observed in the percentage of animals with symptoms recorded as a pus foci, contamination and congestion (from 8.08% to 8.51%). The item "other lesions" in cattle and pigs showed an increase in percentage (Lis and Górski 2011; Lis and Iwanina 2011).

The frequency of conditions and lesions of slaughter animals shows territorial variation in Poland. Data enabling analyzing the incidence of the most significant conditions and lesions of slaughter animals in different regions of Poland are summarized in Tables 3–5. Pus foci contamination and congestions are the most common lesions of slaughter animals in Poland. Changes such as these were found in all voivodeships in carcasses of cattle and pigs (Table 3). The highest percentage of pus foci, congestion and contamination in cattle carcasses was found in the Kujawsko-Pomorskie (98.07%), Zachodniopomorskie (76.16%) and Śląskie (69.45%) voivodeships. In contrast, voivodeships with a low frequency of such changes include Podkarpackie, Warmińsko-Mazurskie and Dolnośląskie (less than 18%) voivodeships. In pig carcasses, pus foci, congestion and contamination occurred in all 16 voivodeships, and much more frequently than in cattle carcasses. In Dolnośląskie, Pomorskie, Małopolskie and Podkarpackie voivodeships these changes were found in more than 90% of the carcasses examined. Only one voivodeship (Śląskie) had the frequency of pus foci, congestion and contamination in pigs carcasses lower than 50%.

The Table 4 summarizes data showing the extensiveness of fasciolosis in cattle by voivodeship. Fasciolosis was not found in cattle in Lubuskie voivodeship only. The Table 4 data shows that the highest extensiveness of fasciolosis occurred in the Warmińsko-Mazurskie voivodeship, where the disease was found in 80.22% of the cattle carcasses examined.

Table 3. The incidence of pus foci, contamination and congestions by voivodships in 2019

Voivodship	Cattle		Pigs	
	number	%	number	%
Dolnośląskie	4 673	17.36	4 407	99.70
Kujawsko-Pomorskie	1 375	98.07	231 296	61.42
Lubelskie	3 129	47.93	107 965	72.39
Lubuskie	4	66.66	139 643	89.62
Łódzkie	8 373	50.47	803 384	79.94
Małopolskie	19 365	67.04	238 619	94.63
Mazowieckie	36 242	49.27	478 771	51.95
Opolskie	7	29.16	19 918	54.17
Podkarpackie	177	1.11	232 810	94.24
Podlaskie	42 923	42.31	709 596	68.09
Pomorskie	1 108	35.11	648 626	97.96
Śląskie	2 858	69.45	46 922	47.90
Świętokrzyskie	833	65.90	32 157	81.76
Warmińsko-Mazurskie	726	17.69	174 110	89.53
Wielkopolskie	43 625	57.43	908 243	51.42
Zachodniopomorskie	476	76.16	62 415	87.76

Table 4. Extensiveness of fasciolosis in cattle by voivodships in 2019

Voivodeship	Number	%
Dolnośląskie	9 948	36.97
Kujawsko-Pomorskie	2	0.14
Lubelskie	2 794	42.80
Lubuskie	0	0.00
Łódzkie	5 132	30.93
Małopolskie	8 912	30.85
Mazowieckie	32 416	44.06
Opolskie	4	16.66
Podkarpackie	6 453	40.51
Podlaskie	28 606	28.20
Pomorskie	1 967	62.34
Śląskie	845	20.53
Świętokrzyskie	394	31.17
Warmińsko-Mazurskie	3 291	80.22
Wielkopolskie	15 494	20.39
Zachodniopomorskie	20	3.20

The Table 5 summarizes data showing the extensiveness of echinococcosis in pigs by voivodeship in 2019. Porcine echinococcosis was found in 15 voivodeships but generally had a low incidence. The highest percentage of pig carcasses with echinococcosis symptoms was found in Świętokrzyskie, Zachodniopomorskie, Mazowieckie and Łódzkie voivodeships (0.53% – 0.61% of examined carcasses). A total of 11.382 cases of echinococcosis in pigs were found in Świętokrzyskie, Zachodniopomorskie, Mazowieckie and Łódzkie voivodeships, accounting for about 71.3% of all cases of the disease in pigs found in 2019 in Poland.

Table 5. Extensiveness of echinococcosis in pigs by voivodeships in 2019

Voivodeship	Number	%
Dolnośląskie	11	0.24
Kujawsko-Pomorskie	24	0.006
Lubelskie	195	0.13
Lubuskie	1	0.0006
Łódzkie	5 328	0.53
Małopolskie	40	0.01
Mazowieckie	5 338	0.57
Opolskie	0	0.00
Podkarpackie	26	0.01
Podlaskie	3 147	0.30
Pomorskie	489	0.07
Śląskie	10	0.01
Świętokrzyskie	280	0.71
Warmińsko-Mazurskie	80	0.04
Wielkopolskie	554	0.03
Zachodniopomorskie	436	0.61

The Table 6 shows the number and percentage structure of unfit animal carcasses by voivodeship. The data shows that the criterion for the number of pork carcasses deemed unfit for consumption is dominated by the western and northern voivodeships of Poland.

Table 6. Percentage of carcasses considered unfit for consumption by voivodeships in 2019

Voivodeship	Cattle		Pigs	
	number	%	number	%
Dolnośląskie	193	0.22	3	0.01
Kujawsko-Pomorskie	18	0.66	134	0.02
Lubelskie	275	0.23	2 745	0.30
Lubuskie	0	0.00	728	0.46
Łódzkie	391	0.18	1 788	0.04
Małopolskie	588	0.20	236	0.03
Mazowieckie	906	0.28	1140	0.05
Opolskie	3	0.18	26	0.02
Podkarpackie	132	0.26	419	0.06
Podlaskie	252	0.11	2 166	0.17
Pomorskie	65	0.16	4 284	0.23
Śląskie	130	0.15	40	0.01
Świętokrzyskie	12	0.11	4 111	0.27
Warmińsko-Mazurskie	134	0.68	3 977	0.32
Wielkopolskie	831	0.16	4 378	0.09
Zachodniopomorskie	359	8.85	4 232	0.30

The number of such carcasses ranged from 3.98 thousand in the Warmińsko-Mazurskie to nearly 4.38 thousand in the Wielkopolskie voivodeship. A large number of pig carcasses were also deemed unfit for consumption in the Świętokrzyskie (4.11 thousand), Lubelskie (2.74 thousand) and Podlaskie (2.16 thousand) voivodeships. The largest number of bovine carcasses deemed unfit for consumption were in the Mazowieckie, Wielkopolskie and Małopolskie voivodeships. The total number of bovine carcasses declared unfit for consumption in these voivodeships amounted to 2.32 thousand, which constituted over 54% of all bovine carcasses disqualified in 2019 in Poland, as unfit for consumption.

## CONCLUSIONS

To summarize, it should be noted that the number of slaughter animals showing health deviations or symptoms and lesions remains relatively high in Poland. The high number of contaminants and congestion is indicative of low attention to slaughter animal turnover conditions, as well as to the hygiene and conditions of slaughter, carcass cutting and handling. Qualitative deviations in the form of emaciation and watery muscles or incomplete loss of blood indicate errors made during rearing or during transport of slaughter animals. As a result, there may be legitimate concerns about proper animal welfare. Parasitic diseases, especially fasciolosis in cattle in some areas, require more effective measures for their reduction. On the other hand, the very low number of trichinellosis cases in pig meat can be considered satisfactory.

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## **ANALIZA CZĘSTOTLIWOŚCI ZMIAN I OBJAWÓW CHOROBOWYCH U BYDŁA I ŚWIŃ W POLSCE NA PODSTAWIE WYNIKÓW BADANIA SANITARNO-WETERYNARYJNEGO W 2019 ROKU**

**Streszczenie.** Zmiany bądź objawy chorobowe stwierdzane przed ubojem i po uboju dostarczają informacji o stanie zdrowia oraz o dobrostanie zwierząt. Badanie zwierząt rzeźnych i mięsa pozwala zmniejszać zagrożenie bezpieczeństwa i zdrowia konsumentów, dlatego powinno być prowadzone systematycznie. Celem badań była analiza wyników badania poubojowego u świń i bydła w Polsce w 2019 r. Analizie poddano dane z badania sanitarno-weterynaryjnego zaczerpnięte z rocznych sprawozdań sporządzanych przez Główny Inspektorat Weterynarii w 2019 r. W ocenie przyczyn zmian chorobowych i niezdatności do spożycia uwzględniono takie jednostki chorobowe, jak: gruźlica, promienica i posocznica, a także odchylenia jakościowe: wychudzenie i wodnicę, żółtaczkę, zmiany organoleptyczne, niedostateczne wykrwawienie, śmierć naturalną, ubój w agonii, ogniska ropne, zanieczyszczenia, przekrwienia i inne zmiany oraz inwazje pasożytnicze: wągry, bąblowce, motylicę wątrobową i włośnicę. Zebrany materiał zestawiono według frekwencji zmian patologicznych stwierdzonych w badaniu sanitarno-weterynaryjnym świń i bydła w poszczególnych województwach w Polsce, a następnie określono ich strukturę procentową. W 2019 r. nadzorem weterynaryjnym objęto ponad 1,9 mln sztuk bydła i ponad 21,5 mln świń. Podczas badania przed- i poubojowego choroby bądź zmiany chorobowe stwierdzono u ponad 7,3 mln sztuk, czyli u 31,4% badanych zwierząt rzeźnych. Odsetek tusz niezdatnych do spożycia u bydła wynosił 0,22%, zaś u świń 0,14%. Spośród zarejestrowanych u świń i bydła zmian chorobowych najliczniejszą grupę stanowiły ogniska ropne, zanieczyszczenia i przekrwienia – odpowiednio 22,4% i 8,51%. Występowanie ognisk ropnych, zanieczyszczeń i przekrwień w tuszach świń i bydła stwierdzono na terenie wszystkich województw. Największy odsetek tych zmian w tuszach bydła zarejestrowano na terenie województw: kujawsko-pomorskiego (50,71%), podlaskiego (19,29%) i zachodniopomorskiego (11,74%). Na terenie wszystkich województw stwierdzono również występowanie ognisk ropnych, zanieczyszczeń i przekrwień w tuszach świń. W województwie lubuskim takie zmiany zarejestrowano w ponad 90% badanych tusz świń, a w województwach podlaskim i kujawsko-pomorskim w ponad 49% badanych tusz świń. W 2019 r. liczba zwierząt rzeźnych wykazujących odchylenia stanu zdrowia bądź objawy i zmiany chorobowe utrzymywała się w Polsce na wysokim poziomie. Duża liczba zanieczyszczeń i przekrwień świadczy o niewystarczającej dbałości o warunki obrotu zwierząt rzeźnych, a także o higienę i warunki uboju oraz rozbioru i obróbki tusz.

**Słowa kluczowe:** zwierzęta rzeźne, badanie poubojowe, zmiany chorobowe.