ANALYSIS OF PATHOLOGIC LESIONS IN THE LIVESTOCK AND POULTRY SLAUGHTERED IN THE MEAT ESTABLISHMENTS OF LITHUANIA

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Summary. The aim of study was to perform the analysis of pathological lesions in the livestock and poultry slaughtered in the meat establishments of Lithuania from 2000 to 2009 and to estimate the disease incidence investigating the post-mortem findings. It has been established that during the survey period, the highest number of pathologic lesions was registered in clinically healthy pigs: 14.92 ± 1.57 %, and the lowest number – in poultry: 0.95 ± 0.21 % ($p < 0.001$). The majority of lesions in poultry, pigs and cattle were classified as the lesions typical for non-infectious diseases − 98.70 %, 82.24 %, and 64.49 %, respectively. Although considerable lesion variations were observed in the organs or systems of different species of animals and poultry, the species influence on the incidence of lesions was statistically insignificant. The highest number of lesions was detected in the respiratory system and liver of cattle and pigs, and in the limbs and liver of turkeys.

Keywords: post-mortem examination, pathologic lesions, livestock, poultry, horses, rabbits, game animals.

LIETUVOS MĖSOS ĮMONĖSE SKERDŽIAMŲ GYVULIŲ IR PAUKŠČIŲ DAŽNIAUSIŲ PATOLOGINIŲ PAKITIMŲ ANALIZĖ

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Santrauka: Šio darbo tikslas buvo atlikti 2000–2009 m. VMVT registruotų gyvulių ir paukščių susirgimų analizę bei nustatyti skerdžiamų gyvulių ir paukščių susirgimų dažnumą poskerdiminio tikrinimo metu. Tarp skerdžiamų kliniškai sveikų gyvulių dažniausiai įvairūs patologiniai pokyčiai nustatyti kiaulėms – 14,92±1,57 proc., o rečiausiai – paukščiams – 0,95 ± 0,21 proc. ($p<0,001$). Vertinant patologinių pokyčių pobūdį, atsižvelgiant į gyvūnų rūšį, daugiausia nustatyta neužkrečiamosioms ligoms būdingų pakitimų. 98,70 proc. paukščių, 82,24 proc. kiaulių, 64,49 proc. galvijų poskerdiminio tikrinimo metu rasta patologinių pakitimų. Nors tirtoms gyvūnų rūšims būdinga ženkli skirtingų organų ar sistemų pakitimų variacija, rūšies įtaka jų dažniui statistiškai reikšminga nebuvo. Daugiausia buvo pakitę galvijų ir kiaulių kvėpavimo sistemos organai ir kepenys, kalakutų – galūnės ir kepenys.

Raktažodžiai: poskerdiminis tikrinimas, patologiniai pakitimai, naminiai gyvuliai, paukščiai, arkliai, triušiai, žvėrys.

Introduction. Risk analysis forms the basis for the safety of foodstuffs. This includes risk assessment during scientific consultations, legal regulation of risk control, management of control by way of preliminary preparation, as well as risk communication among all the factors in the foodstuff chain. The European Food Safety Authority (EFSA), which ensures an independent scientific level is concerned about safeguarding the consumers' health and encourages fair activity of the businesses. At all the stages of the foodstuff chain the businesses must aim at ensuring the safety of foodstuffs of any kind (Heeschen, 2004). The responsibility starts at the manufacturer of feeds throughout the supplier, production establishment, the veterinarian in charge of the establishment, the grower, possibly the dealer, the slaughterhouse, the processing establishment, to the retail trade. Priority concern includes safety, stability and transparency at all the levels of production, as well as the harmonization and optimisation of data flow among the certain stages of production (Karge et al., 2002). The system of quality complex management originates from the general economy science. The hypothesis rests on the presumption that the later the shortcoming is revealed, the more expensive its elimination is (Schmalen, 2001). Control of the production must be delegated to the control of the manufacturing process, and the primary production must become an integral component of the modern concept of quality management (Kargenkuber, 2002). Setting up a system for data exchange between the primary producer and the slaughterhouses that provide information is an indispensable prerequisite for conformity with the hygiene and quality requirements of the market. Similar systems have been tested in Denmark, Netherlands and Germany. Regular data exchange among all the factors in the manufacturing

process is ongoing throughout the phases of the manufacturing process where the specific criteria have been set (Adam, 2001). In 2004, the so-called "Hygiene Package" was drawn up on the basis of the fundamental Regulation 178/2002. Regulations (EC) 852/2004, 853/2004 and 854/2004 make the kernel of the package. In the EU, the provisions of the regulations have been applicable since 9 January 2006 and have conditioned an essential restructuring of the national hygiene legislation of different countries (Stähle, 2004).

M. Hartung (2005) considers that the data of the analysis of the slaughtered animal and its meat provide ample information on the potential danger for human health and for animal herds.

Several scientists pointed, that inspection methods of the ante-mortem and post-mortem examination should be revised (modified) (Stock et al., 1999; Anhalt, 2000; Fries, 2001). Some other researchers do not support the opinion of A. Kobe et al. (2000) that traditional control of meat should be replaced by visual meat inspection. According to H. Möbius (2002), under the current conditions of meat production and in the absence of legal evidence on the animal origin and the information feedback, the visual meat inspection alone is premature.

The data of veterinary inspection enable to make conclusions both on the health status of the herd (Köfer et al., 2001) and on the quality of the carcase (Blaha et al., 1995; Dailidavičienė et al., 2009; Januškevičienė et al., 2009). Furthermore, the information obtained in this way coupled with the information accumulated in the rearing establishment (e. g. earlier diseases and therapy performed, as well as test results) provide general (complex) information on the health of the animals and the preliminary conclusions on the carcases quality. A functional information system which would gather information on the slaughtered animals and make it accessible is the key goal (Fries, 2000; Predoiu, 2000; Petersen et al., 2002; Schulze Althoff et al., 2002). Through the feedback, the farmer can apply the information on the farm for improvement of the both animals health and meat quality (Snijders, 2000). Also, it should not be forgotten that the optimised information system enables the veterinary inspector to make prompt decisions on the slaughter of the animals (Schulze Althoff, 2004).

Integration of the alternative meat control into the systems of quality assurance enables to carry out a risk assessment-oriented analysis of meat (Pointon et al., 2000; Hamilton et al., 2002; Pöcker et al., 2004; Schruff, 2004). Regulation (EC) No 854/2004 lays down that the nature and intensity of the official controls should be based on the assessment of public health risks, animal health and welfare, the type and throughput of the processes carried out and the food business operator concerned, the goal being to make a maximal assessment of risk in striving for a desired "protection level" (den Hartog et al., 2000; Ellerbrock et al., 2005, Pöcker et al., 2004). However, it should be noted that the data on primary production do not always provide reliable prediction and by no means can fully replace the examination of meat.

Materials and methods. The survey was carried out in 2007–2009, during which a retrospective analysis of the animal diseases registered in the SFVS reports of post-mortem examination in 2000–2009 was made. For a detailed analysis of animal diseases detected during post-mortem examination four animal and four poultry slaughterhouses were selected, to which animals reared in different regions of Lithuania were delivered. Post-mortem examination of slaughtered healthy animals was made according to the Regulation (EC) No 854/2004.

Standard descriptive statistics – arithmetic means ($\bar{x}$), standard errors (mx), standard deviations (σ) and coefficients of variations (Cv) was calculated. Experimental data were tested by regression analysis, ANOVA and $\chi 2$ test. Significance was indicated by $p < 0.05$ using the statistical software SPSS (version 15, SPSS Inc., Chicago, IL).

Study Results. In 2000–2009, in the slaughter units of the Lithuanian meat establishments, during post-mortem examination 285585153 animals were inspected (Table 1).

Table 1. **Number of animals inspected during post-mortem examination, 2000–2009**

Species	Number of animals examined	Percentage
Cattle	2426008	0,85
Pigs	8394756	2,94
Poultry	274539360	96,13
Sheep and goats	47167	0,02
Horses	8351	0,00
Rabbits	98878	0,03
Game	70633	0,02
Total	285585153	100

Poultry made up the largest portion of the animals examined – 96.13 %; game, sheep and goats – the smallest – 0.02 %. The average number of animals with no clinical signs in which pathologic lesions were detected during post-mortem examination (Table 2) varied in different years from 2.78 % (in 2000) to 7.79 % (2008). The species-specific variations were very high (Cv = 110.22–169.42 %).

Table 2. **Percentage of diseased animals in different years**

Species	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total 2000–2009
Cattle	4.350	4.100	4.548	3.669	5.129	5.494	10.672	10.517	19.955	22.372	8.40
Pigs	8.572	11.433	9.885	13.598	13.365	13.393	17.038	20.193	23.242	18.523	14.77
Poultry	0.618	0.359	0.410	0.356	0.623	0.808	0.668	1.324	2.146	1.697	0.95
Sheep, goats	3.192	3.409	2.397	1.593	1.091	0.501	0.579	0.943	2.452	1.203	1.50
Horses	0.000	0.000	0.000	0.000	0.000	12.500	0.000	0.000	6.136	1.052	6.26
Rabbits	0.000	0.000	0.000	0.013	0.000	0.000	0.000	0.554	0.570	0.148	0.14
Game	2.725	3.812	3.505	1.159	0.234	0.224	0.331	0.000	0.000	2.841	1.32
$\overline{X}$	2.78	3.30	2.96	2.91	2.92	4.70	4.18	4.79	7.79	6.83	4.76
σ	3.06	4.03	3.54	4.88	4.95	5.94	6.86	7.75	9.68	9.40	5.39
m_x	1.25	1.65	1.44	1.99	2.02	2.43	2.80	3.17	3.95	3.84	2.20
Cv	110.22	122.08	119.39	167.61	169.42	126.38	164.01	161.86	124.38	137.56	113.07

Table 3. **Proportion of diseased animals detected in 2000–2009**

Species	$\overline{X}$	mx	Min	Max	σ	Cv
Cattle	9.08	2.29	3.67	22.37	6.87	75.68
Pigs	14.92	1.57	8.57	23.24	4.70	31.49
Poultry	0.90	0.21	0.36	2.15	0.62	68.37
Sheep, goats	1.74	0.35	0.50	3.41	1.06	60.97
Horses	1.97	1.39	0.00	12.50	4.17	211.63
Rabbits	0.13	0.08	0.00	0.57	0.23	181.35
Game	1.48	0.52	0.00	3.81	1.56	105.12

During the survey period, the highest percentage of pathologic lesions in clinically healthy animals before slaughter was observed in pigs – 14.92 ± 1.57 %, and the lowest - in poultry – 0.95 ± 0.21. ($p < 0.001$). The findings are presented in Table 3.

Animal species was responsible for 69.47 % of factorial dispersion in the prevalence of diseases and was statistically significant ($p < 0.0001$). It has been presumed that the most pronounced increase in the number of lesions diagnosed during the post-mortem examination will be observed in pigs – annually by 1.42 % ($R^2 = 0.835$) (Fig. 1), cattle – 1.97 % ($R^2 = 0.7503$) (Fig. 2), and poultry – 0.169 % ($R^2 = 0.6913$) (Fig. 3).

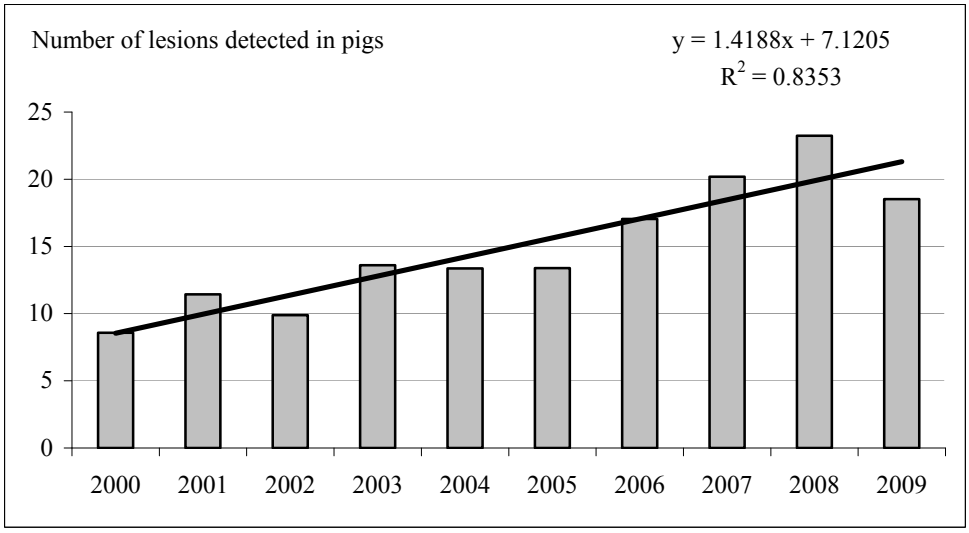

Fig. 1. **Prediction on the number of lesions detected in pigs during post-mortem examination**

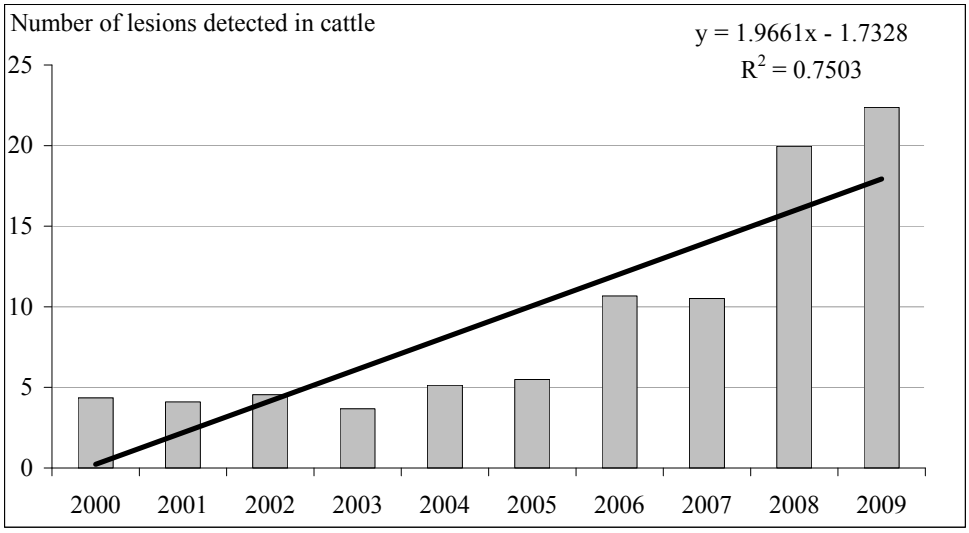

Fig. 2. **Prediction on the number of lesions detected in cattle during post-mortem examination**

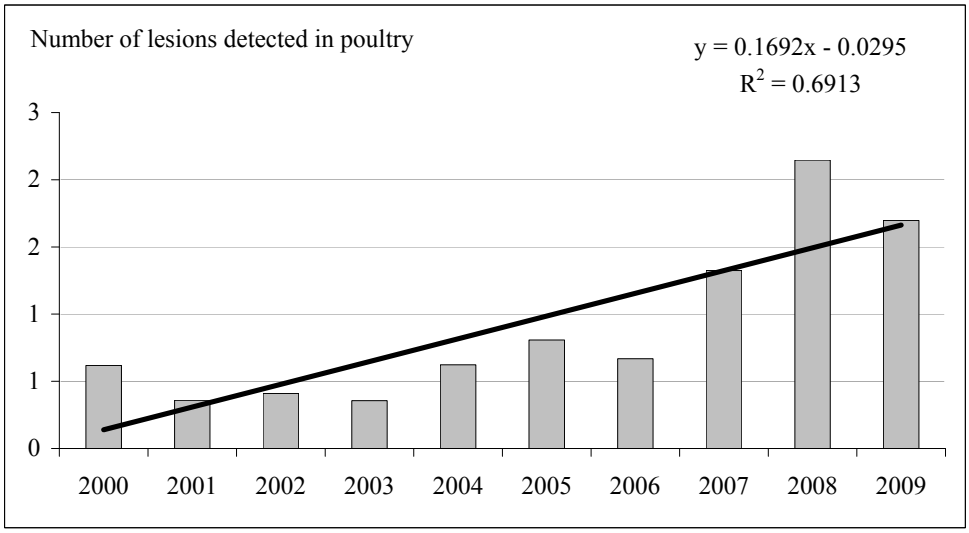

Fig. 3. **Prediction on the number of lesions detected in poultry during post-mortem examination**

The analysis of the structure of the diseases diagnosed post-mortem has shown that during the ten years, non-infectious diseases on average comprised 11.35 %, invasive – 2.61 %, infectious 0.01 %; among cattle – 5.42 %, 3.48 %, and 0.005 % respectively of all the examined animals that had no clinical signs of the disease. Among poultry, non-infectious diseases made up 1.04 %, infectious – 0.01 % of all the inspected poultry with no clinical signs, meanwhile invasive diseases, which according to the reports were diagnosed in the year 2004 alone, were detected in 0.05 % of the poultry slaughtered that year (0.004 % of the poultry slaughtered over the period of 10 years). In sheep and goats the non-infectious diseases accounted for 1.04 %, invasive – 0.47 %, infectious – 0.01 % of all the examined and recognised as clinically healthy sheep and goats.

In slaughter horses, non-infectious diseases made up 0.72 %, invasive – 4.35 %, whereas over the period of ten years no infectious diseases were diagnosed.

In rabbits, non-infectious diseases amounted to 0.15 %, no invasive diseases were diagnosed during the post-mortem examination, and infectious diseases were only diagnosed in the year 2007: total of 38 cases, which accounted for 0.34 % of the rabbits slaughtered that year, and 0.04 % of the rabbits slaughtered over the period of 10 years that had no clinical signs of diseases.

Over the period of 10 years, non-infectious diseases in game were diagnosed only twice. In 2009 they made up only 0.04 % of the wild animals examined in the slaughterhouse that year (over the period of 10 years – 0.003 %), invasive – 2.61 %, infectious – 0.01 % of all the wild animals examined over the 10 year period that had no clinical signs of diseases.

As regards the type of pathologic lesions, with species taken into account, the lesions typical for non-infectious diseases comprised the highest proportion. In poultry they made up 98.70 %, in pigs – 82.24 %, cattle – 64.49 % of all the pathologic lesions detected during the post-mortem

examination. Meanwhile, invasive diseases in pigs accounted for 17.72 % and infectious – 0.04 %; in cattle – 35.81 % and – 0.05 %, respectively, and in poultry – 0.42 % and 0.68 % of the animals exhibiting pathologic lesions. In game animals, infectious diseases were diagnosed: in the year 2001 – 319 cases which comprised 34.30 % of all the pathologic lesions diagnosed over the period of 10 years; in 2003 – 66 cases were detected which comprised 7.10 % of the pathologic lesions detected over the period of 10 years, and in 2009 total of three cases of infectious diseases were detected (0.32 %). In rabbits, infectious diseases accounted for 27.14 % of all the pathologic lesions detected over the period of 10 years.

The data of the linear regression presented in Table 4 have shown that the highest annual increase of invasive diseases is predicted in horses – 0.81 %; in which the yearly frequency variation of invasive diseases is 30.84 %. In predicting the diseases the highest determinant coefficient is given to cattle – 79.75 %, predicting 0.38 % the annual increase of invasive diseases. Whereas, a decrease of invasive diseases is predicted for sheep and goats and game (0.22–0.29 %, $R^2 = 0.49–0.67$).

Table 4. **Prediction of invasive diseases detected during post-mortem examination**

Pigs	Cattle	Game	Sheep, goats	Horses	Poultry	Rabbits
y = 0,1318x + 1.824	y = 0.3767x + 1.044	y = -0.2859x + 2,3973	y = -0.2215x + 1,88	y = 0.8074x - 2,8867	y = 0.1736x - 0,074	y = 0.0387x - 0,12
$R^2 = 0.0825$	$R^2 = 0.7975$	$R^2 = 0.4881$	$R^2 = 0.6686$	$R^2 = 0.3084$	$R^2 = 0.7104$	$R^2 = 0.4057$

The analysis of the poultry disease structure showed that infectious diseases made up 0.68 %, non-infectious diseases – 98.70 % of all the poultry with pathologic lesions; infectious diseases were diagnosed in 0.01 % of all the examined poultry that had no clinical signs, whereas invasive diseases were diagnosed only in the year 2004 in 0.05 % of the poultry slaughtered that year, and non-infectious diseases – in about 1.04 %. During the recent decade, the shifts in the incidence of infectious diseases have been irregular (Fig. 4). Most of the cases were detected in the year 2000 – 0.06 %, and from in 2001 to 2003 – 0.02 % of the overall number of the poultry slaughtered. Since 2004, the incidence of infectious diseases has been gradually decreasing and currently amounts on average to 92 cases per year.

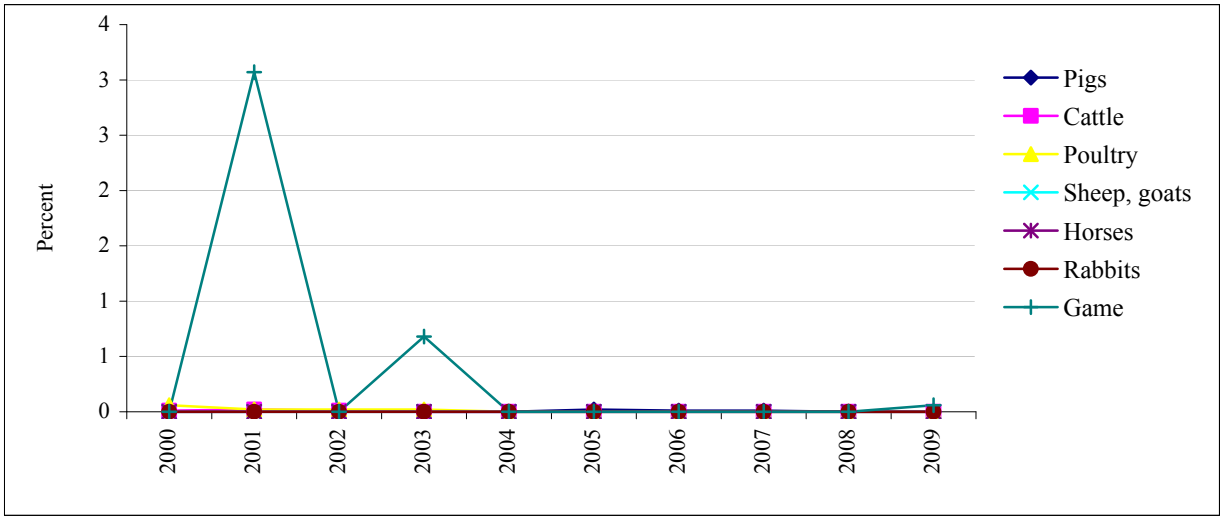

Fig. 4. **Infectious diseases (%) detected during the 2000–2009 ante/post-mortem examinations performed on animals slaughtered in food establishments**

Since 2007, the SFVS reports contain the species-related information on the poultry. In turkeys infectious diseases were diagnosed in the year 2007 and 2008 and made up 0.02–0.07 % of all the examined turkeys that had no clinical signs. In ducks no infectious diseases were diagnosed, and in chickens the cases were rare (12–104 birds). Invasive diseases were not diagnosed in any of the species (Fig. 5).

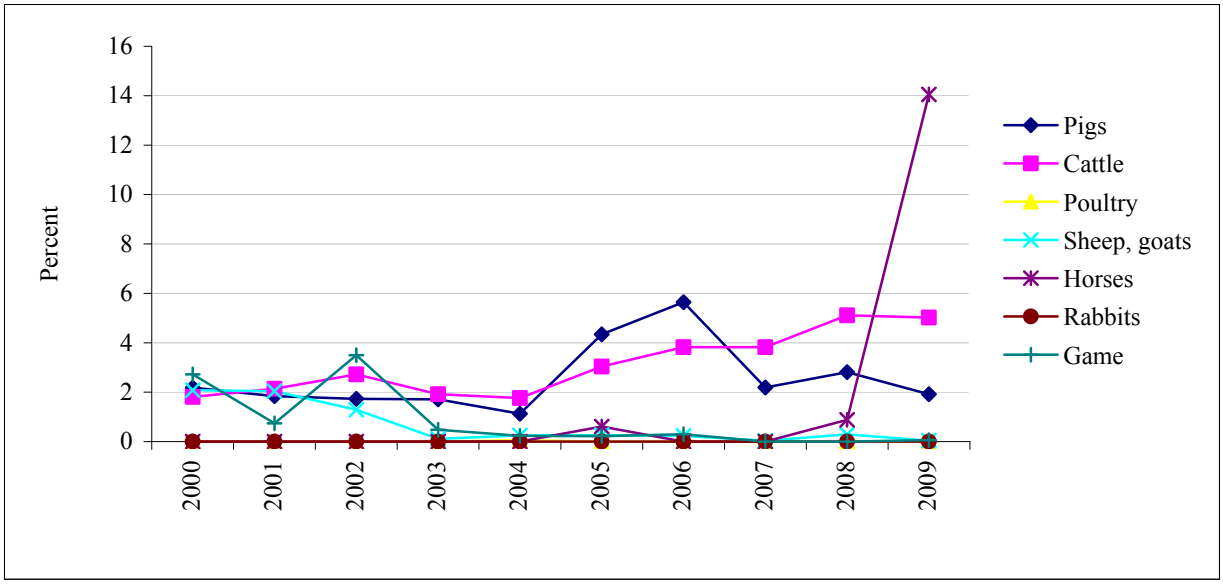

Fig. 5. **Invasive diseases (%) detected during the 2000–2009 ante/post-mortem examinations performed on animals slaughtered in food establishments**

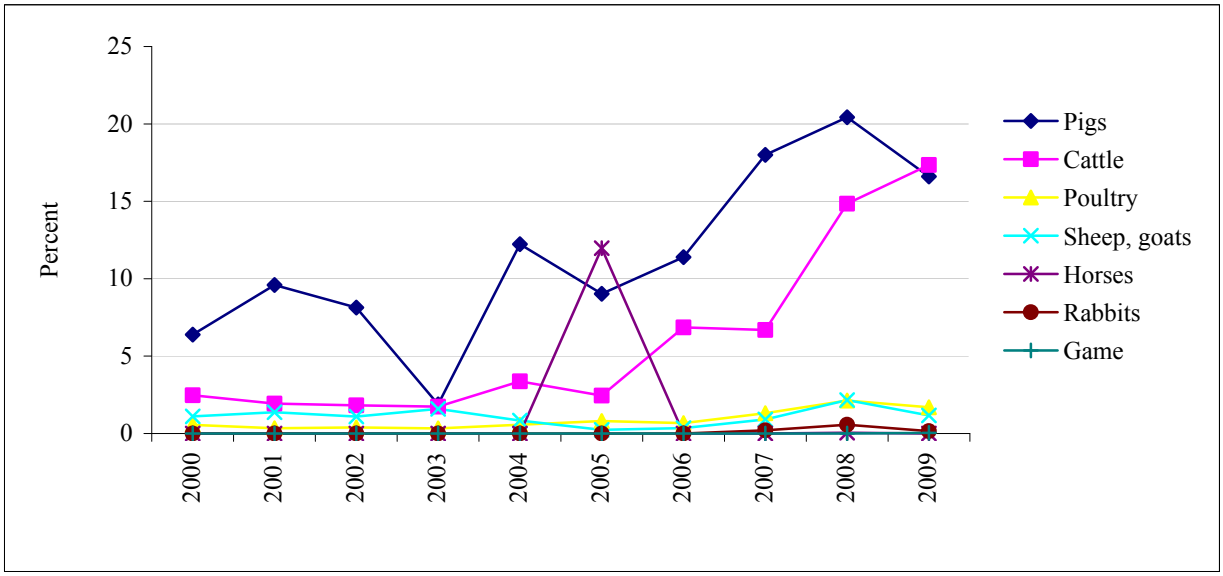

Fig. 6. **Non-infectious diseases (%) detected during the 2000–2009 ante/post-mortem examinations performed on animals slaughtered in food establishments**

Meanwhile incidence of non-infectious diseases was the highest in turkeys: 5.36–10.77 % (8.30 % on average); in chickens non-infectious diseases accounted for 1.31–2.05 %, and in ducks – 0.00 to 0.29 %, respectively (Fig.6).

Meanwhile the prediction on the incidence of non-infectious diseases in poultry (Table 5) indicates that the diseases pose the greatest risk for turkeys, in which an annual increase of 1.92 % was predicted (R^2 = 0.47). The most precise linear regressive prediction was made with respect to non-infectious diseases in ducks – 92.92 %, in which the annual increase at 0.12 % was predicted.

Table 5. **Prediction of incidence (%) of non-infectious diseases detected during post-mortem examination of poultry**

Turkeys	Chickens	Ducks
y = 1.915x + 4,61	y = 0.155x + 1.35	y = 0.115x + 0.0733
R^2 = 0.4739	R^2 = 0.174	R^2 = 0.9292

The analysis of SFVS reports of 10 years has shown that the structure of non-infectious diseases remains vague. The reports on veterinary sanitary surveillance do not include the data on the specific non-infectious diseases diagnosed during the post-mortem examination and they do not specify the pathologies detected in the event of non-infectious diseases, either. The post-mortem examination performed in slaughterhouses of various capacities has shown lesions of liver and respiratory organs, to be the most frequent, and those of skin and kidneys – the least frequent. The greatest species-related variation is seen in lesions of skin and genitals, as well as in the ones of limbs (Table 6).

Table 6. **Average occurrence of lesions per all species detected during post-mortem examination in meat establishments, 2007–2009, %**

Lesions	$\overline{X}$	m_x	σ	Cv
Respiratory[1]	35.61	26.96	38.12	107.07
Cardiac[2]	7.84[*24]	0.00	1.42	18.07
Digestion[3]	7.94[*34]	2.17	3.07	38.69
Gender[4]	0.40[*46; 26]	0.48	0.68	171.03
Kidney[5]	6.16	3.78	5.34	86.81
Liver[6]	34.19[**67]	7.43	10.50	30.72
Spleen[7]	10.79	8.30	11.73	108.70
Skin[8]	3.87[**68]	4.72	6.67	172.31
Limbs[9]	29.03	34.76	49.16	169.31

* $p < 0.05$; ** $p < 0.01$; ***$p < 0.001$

Although in the species under the survey an obvious variation in the lesions of different organs or systems was typical, the importance of the species considering the frequency of occurrence was statistically insignificant. The largest number of lesions was registered in the respiratory system and in liver of cattle and pigs, and in the limbs and liver of turkeys (Table 7).

Table 7. **Lesions detected in pigs, cattle and turkeys as a result of post-mortem examination in meat establishments, 2007–2009, %**

Lesions	Cattle[1]	Pigs[2]	Turkeys[3]
Respiratory	20.44	78.98	7.4
Cardiac	8.41	6.23	8.89
Digestion	10.49	8.81	4.53
Gender	0	1.18	0.01
Kidney	9.6	8.87	0
Liver	25.09	31.79	45.68
Spleen	3.13	4.95	24.3
Skin	0	0.04	11.57
Limbs	0	1.31	85.79
$\overline{X}$	8.57	15.80	20.91
m_x	3.23	9.04	9.99
σ	9.14	25.56	28.26
Cv	106.62	161.80	135.19
p	0.297 [1-2]	0.711 [2-3]	0.25 [1-3]

Results and Discussion. A retrospective analysis of SFVS veterinary sanitary inspections of 10 years has confirmed the scientific assertion that veterinary inspection data enable to make conclusions both on the health status of the herd and on the quality of the carcase (Köfer et al., 2001). The data obtained in this way and coupled with the information accumulated in the establishment (e. g. former diseases, treatment, test results) provide general (complex) information on the health of the animals and also suggest preliminary conclusions on the quality of the carcases. The main goal is putting in place a functional information system for gathering information on slaughter animals and for making it accessible (Fries, 2000; Predoiu, 2000; Petersen et al., 2002; Schulze Althoff et al., 2002).

The findings of the ante- and post-mortem examinations testify to a favourable situation with respect to infectious diseases in Lithuania. However, pathologic lesions typical for non-infectious diseases were quite common. An annual growth of pathologic lesions typical for non-

infectious diseases by 10.4 % was registered, invasive diseases – by 2.0 %, whereas infectious diseases were diagnosed less frequently – by 11.9 % (8.2 cases). The determination of the situation is highly important, since any health disorder in the animal is not only the cause of lesions in certain organs of the animal, but also has a direct impact on the sanitary health and carcase quality of the slaughtered animal, which is an essential component in the chain of food control that ensures food safety and, hence, the public health.

The post-mortem examination showed that in pigs, among the lesions attributed to non- infectious diseases, lung pathologies were prevalent – 70.4 % of the slaughtered clinically healthy pigs, followed by liver pathologies – 32.5 %. Kidney pathologies accounted for 8.9 %, cardiac pathologies – 6.2 %, digestion tract – 5.4 %, genitals – 1.2 %, and carcase pathologies – 19.84 %.

Thus, in pigs the lungs do not only testify to the health status of the animals but also contribute to the added value of the product. Therefore, detection of lesions in lungs is an important parameter in making an assessment of economic losses, especially the ones incurred by enzootic pneumonia (Šiugždaitė et al., 2006). The frequency of lung pathology in the country revealed by our survey is in parallel to the findings by other scientists who have been researching indication of lung pathology in pigs. According to them, lung pathology is the most frequently diagnosed pathology in pigs during post-mortem examination (Hanson et al., 2000; Osborne et al., 1981; Wilson et al., 1986). The importance of lung pathology in pigs is also confirmed by the research carried out in the Czech Republic – lung pathology was diagnosed in 72.11 % of pigs (Vecerek et al., 2004), in Austria – 77.9–83.3 % (Köfer et al., 1993; Schuh et al., 2000), in Germany – 21.6–77 % (Uhlemann et al., 1970). In poultry, among the lesions attributed to non-infectious diseases, pododermatitis was prevalent. It was diagnosed in 95.54 % of turkey males and 8.51 % – females. In the opinion of the researchers Sanotra et al. (2001) and Krautwald-Jungehanns (2003), limb diseases are quite common in the intensive turkey production systems of turkeys. Pododermatitis poses the greatest problem in the poultry, affecting from 9 to 82 % of the flock (Breuer et al., 2005; Hafez et al., 2005).

The researcher Aziz (2003) considers that arthritis is fairly uncommon and affects 0.03 – 5.0 % of the flock. The post-mortem examination in the slaughterhouse showed that 3.56 % of male turkeys and 0.58 % of females had arthritis.

Other lesions in male turkeys included dermatitis – 4.56 %, peritonitis – 0.91 %, ascites – 0.67 %. In female turkeys, the above lesions were diagnosed much less frequently.

Lithuanian farms and food establishments sustain considerable economic losses due to rejected meat. Insufficient feedback to the farms from food establishments, failure to analyse the reasons for rejection of meat and offal which could be helpful in finding out the animal health problems in different husbandry systems are among the major concerns. Awareness of the problems might facilitate the implementation of the preventive measures, and contribute to the products safety and animal welfare.

Supply of information on the findings of post-mortem examination to the farms would contribute to the improvement of the health status of the herds, particularly with respect to non-infectious and invasive diseases, and to a more effective application of preventive or therapeutic measures.

Conclusions. It can be concluded from the present study that the findings of the ante- and post-mortem examinations testify to a favourable situation with respect to infectious diseases in Lithuania. Among non-infectious diseases lung pathologies were most prevalent – from 7.4 % to 78.98 % of slaughtered livestock and poultry. Pododermatitis poses the greatest problem in poultry. In turkeys, among the lesions attributed to non-infectious diseases, pododermatitis was diagnosed in 95.54 % of turkey males and 8.51 % – females. Lithuanian farms and food establishments sustain considerable economic losses due to rejected meat. Insufficient feedback to the farms from food establishments, failure to analyse the reasons for rejection of meat and offal which could be helpful in finding out the animal health problems in different husbandry systems are among the major concerns.

References

1. Adam F. Qualitätsmanagement auch in der Schweineproduktion Schweinezucht und Schweinemast. 2001. 3/01. s. 20–24.

2. Anhalt G. Ist die Durchführung der Schlachttier und Fleischuntersuchung noch zeitgemäß? BgVV. Berlin. 2000. s. 93–96.

3. Aziz T. Round-heart disease – a common problem in turkeys. World Poult., 2000. 18 (Special). P. 22–23

4. Blaha T., ir Blaha M. L. Qualitätssicherung in der Schweinefleischerzeugung. Jena, Stuttgart, Gustav Fischer. 1995. s. 25–38.

5. Breuer P., Buda S und Budras K. D. Ätiopathologie der Pododermatitis bei Putenküken einer schwereren Mastrasse. 26. Kongress der DVG: Tierschutz, Leistung und Gesundheit. Berlin. 2005 Posterbeitrag Nr. 38, s. 139.

6. Dailidavičienė J., Januškevičienė G., Milius J., Mieželienė A., Alenčikienė G. Influence of lung pathology on pig carcasses' microbiological quality and sensory parameters. // Bull Vet Inst Pulawy, ISSN 0042-4870. 2009. T. 53. N. 3. P. 433–438.

7. Den Hartog J .M. P. ir Snijders J. M. A. Een mogelijke aanpak om de huidige vleeskeuring te verbeteren. Tijdschr. Diergeneesk. 2000. 125.s. 222–224.

8. Ellerbrock L., Berg Ch., Meermeier D. Paschertz K. Delbeck. F. Risikoorientierten Ansatz im Rahmen der durchfuhrung der schlachtier und Fleischuntersuchung. Rundschau fur Fleischhygiene und Lebensmitteluberwachung. 2005.10. s. 219–222.

9. Fries R. Durchführung der Schlachttier- und Fleischuntersuchung. Stand der Diskussion um den Einsatz integrierter Systeme. Berl. Münch. Tierärztl. Wochenschr. 2000. 113 (1). s. 1–8.

10. Fries R. Sichere Überwachung Lebensmittel liefernder Tiere: Versuch einer Ableitung Berl. Münch. tierärztl. Wochenschr. 2001. 114. s. 438–444.

11. Hafez H. M., Haase S., Wäse K., Hoffmann T., Hauck R., Simon O. Bergmann V. Zum "Beinschwäche-Syndrom" bei genetisch verschiedenen Putenlinien. DVG-Kongress "Tierschutz, Leistung und Gesundheit", Berlin, Posterbeitrag. 2005. 34. s. 135.

12. Hamilton D. R., Gallas P., Lyall L., Lester S., Mcorist S., Hathaway S. C., Pointon A. M. Risk-based evaluation of postmortem inspection procedures for pigs in Australia. Vet. Rec. 2002. 151. P. 110–116.

13. Hansson I., Hamilton C., Ekman T., Forslund K. Carcass quality in certified organic production compared with conventional livestock production. J. Vet. Med. B. 2000. 47. P. 111–120.

14. Hartung M. Fleischforschung und Entwicklung, Ergebnisse der Zoonosenerhebung 2003 in Deutschland bei Lebensmitteln. Fleischwirtschaft. 2005. 4. s. 116–121.

15. Heeschen W. Das neue EU-Hygienepaket Hamburg. Behr's Jahrbuch für Lebensmittelwirtschaft. 2004. s. 52–59.

16. Januškevičienė G. Januškevičius A. Dailidavičienė J. Kiaulių transportavimo ir skerdimo technologijų įtaka mėsos kokybei. Veterinarija ir zootechnika. ISSN 1392-2130. T. 48 (70). 2009. P. 6–16.

17. Karge E., Hacke H., Karge J. Analyse und Wertung der Ergebnisse und des Nutzens integrierter Zusammenarbeit von Unternehmen der Land- und Ernährungswirtschaft unter dem Aspekt einer hohen Lebensmittelsicherheit. Sammelband der Edmund Rehwinkel-Stiftung: Lebensmittelsicherheit und Produkthaftung – neue Entwicklungen in der integrierten Produktion und Vermarktung tierischer Erzeugnisse, Schriftenreihe Band 16, Frankfurt a. M.: Landwirtschaftliche Rentenbank. 2002. s. 184–210

18. Kargenhuber M. Unterschiede und Gemeinsamkeiten vertikaler Prozessorganisationen im Bereich der integrierten tierischen Produktion und Vermarktung – ein europäischer Vergleich. Sammelband der Edmund Rehwinkel-Stiftung: Lebensmittelsicherheit und Produkthaftung – neue Entwicklungen in der integrierten Produktion und Vermarktung tierischer Erzeugnisse, Schriftenreihe Band 16. Frankfurt a. M.: Landwirtschaftliche Rentenbank. 2002. s. 168–176.

19. Kobe A., Bandick N., Koopmann L., Dahms S., Weiss H., Fries R. Comparison of two different meat inspection techniques. Vet. Q. 2000. 22. P. 75–83.

20. Köfer J., Awad-Masalmeh M., Thiemann G. Der Einfluß von Haltung, Management und Stallklima auf die Lungenveränderungen bei Schweinen. Dtsch. Tierärztl. Wschr. 1993. 100. s. 319–322.

21. Köfer J., Kutschera G., Fuchs F. Tiergesundheitsmonitoring durch Organbefundung am Schlachthof. Fleischwirtsch. 2001. 81. s. 107–111.

22. Krautwald-Jungehanns M. E. Putenproduktion in Deutschland: Ansätze für eine tierschutzgerechte Haltung. Deutsche Tierärzteblatt. 2003. 1. s. 4–8

23. Möbius H. Epidemiologisch-biometrische Bewertung von Ergebnissen der Fleischuntersuchung in Deutschland. Leipzig, Univ., Vet.med. Fak. Diss. 2002. s. 129.

24. Osborne A. D., Saunders J. R., K-Sebunya T. An abattoir survey of the incidence of pneumonia is Saskatchewan swine and an investigation of the microbiology of affected lungs. Can. Vet. J. 1981. 22 (4). P. 82–85.

25. Petersen B., Knura-Deszczka S, Pönsgen-Schmidt E., Gymnich S. Computerised food safety monitoring in animal production. Livest. Prod. Sci. 2002. 76. P. 207–213.

26. Pöcker C., Schulze Althoff G., Petersen B., Blaha T. „Risikoorientierte Fleischuntersuchung" - Ein Informations und Entscheidungsmodell. Fleischwirtschaft 84. 2004. s. 114–116.

27. Pointon A. M., Hamilton D., Kolega V. Hathaway S. Risk assessment of organoleptic postmortem inspection procedures for pigs. Vet. Rec. 2000. 146. P. 124–131.

28. Predoiu J. Erfassung von Daten im Rahmen der Schlachttier- und Fleischuntersuchung -Veterinär-Untersuchungsdaten-Verwaltungssystem (VUV) als Bestandteil eines Integrierten Fleisch-Informationssystems (IFIS). BgVV. Berlin. 2000. s. 65–72.

29. Sanotra G. S., Lawson L. G. und Vestergaard K. S. Influence of stocking density on tonic immobility, lameness, and tibial dyschondroplasia in broilers. J. Appl. Anim. Welfare Sci., 2001. 4. P. 71–87.

30. Schruff C. Lehrbuch der allgemeinen Pathologie für Tierärzte und Studierende der Tiermedizin. 10. Aufl., Verlag Enke Stuttgart. 2004. s. 86–92.

31. Schuh M., Kofer J., Fuchs K. Installation of an information feedback system for control of animal health - frequency and economical effects of organ lesions in slaughtered pigs. Wien. Tierartztl. Mschr., 2000. 87. P. 40–48.

32. Schulze Althoff G. Informationsmanagement in Netzwerken und Ketten der Schweinefleischerzeugung -Herausforderungen, Möglichkeiten, Grenzen. 2004. s. 128–133.

33. Schulze Althoff G., Schmitz T., Petersen B.

Qualitätssicherung: Netzwerk überwindet Grenzen.Systemlösungen für integriertes Kettenmanagement in der Schweinefleischerzeugung. Fleischwirtsch. 2002. 82. s. 17–18.

34. Schmalen H. Grundlagen und Probleme der Betriebswirtschaft. 11. vollst. überarb. und erw. Aufl. Studienausg. Stuttgart: Schäffer-Poeschel. 2001.

35. Snijders J. M. A. Kann ein integriertes Qualitätssicherungsprogramm die herkömmliche Schlachttierund Fleischuntersuchung ersetzen? BgVV, Berlin. 2000. s. 97–100.

36. Stähle S. Konsolidierung des Europäischen Hygienerechts. in: Behr's Jahrbuch für die Lebensmittelwirtschaft 2005. Behr's Verlag, Hamburg. 2004. s. 29–33.

37. Stock K., Stolle A., Lachhammer K., Kröll J. Amtliche Fleischuntersuchung von Schweinen. Modellvorstellung zur Organisation und zum Personaleinsatz. Fleischwirtsch. 1999. 79. s. 88–93.

38. Šiugždaitė J., Jukna Č., Jukna V., Žilinskas H., Garlaitė K. A field trial to study efficacy of *Respisure One*® vaccine against pigs mycoplasmal pneumonia. Acta Veterinaria (Beograd). 2006. 56 (4). P. 333–341.

39. Uhlemann J. ir Jahn H. Zur Organisation der veterinärmedizinischen Betreuung im Kooperationsverband „Fleischschweinproduktion" Plauen. Mh. Vet. Med. 1970. 25. s. 853–859.

40. Vecerek V., Kozak A., Malena M., Chloupek P., Pistekova V. Organs of slaughter pigs as a source of potential risk for human health in the Czech Republic during the years 1995–2002. Vet. Med. Czech. 2004. 49 (3). P. 75–78.

41. Wilson M. R., Takov R., Friendship R. M., Martin S. W., McMillan I., Hacker R. R., Swaminathan S. Prevalence of respiratory diseases and their association with growth rate and space in randomly selected swine herds. Can. J. Vet. Res. 1986. 50. P. 209–216.

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