Effects of transport distance and the season of the year on death rates among hens and roosters in transport to poultry processing plants in the Czech Republic in the period from 1997 to 2004

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ABSTRACT: Poor welfare is the cause of high mortality among hens and roosters transported to poultry processing plants. In the Czech Republic, death rates among hens and roosters in transport to poultry slaughter plants were monitored between 1997 and 2004, and their total mortality rate was in the 0.925% ± 0.479% range. Death rates among hens and roosters were influenced by the transport distance to poultry processing plants. The percentage of dead birds increased from 0.592% ± 0.575% at transport distances up to 50 km to 1.638% ± 0.952% at transport distances up to 300 km. The bird mortality was also influenced by the season of the year. Higher mortality rates were ascertained during the cold months of the year, specifically in October through to April.

Keywords: welfare; stress; poultry; mortality; transportation time; ambient temperature; winter months

Increased numbers of birds dead or bruised and high incidence of bone breakage are reported in connection with improper handling and transportation of poultry to processing plants (Knowles and Broom, 1990). The factors that influence the bruising and mortality of broilers during catching, transport and lairage have been studied by Nijdam et al. (2004). They reported the mean percentage of birds dead on arrival (DOA) to processing plants at 0.46. Causes of trauma in broilers arriving dead at poultry processing plants were also investigated by Gregory and Austin (1992). They found 0.19% of birds dead on arrival to processing plants. Vecerek et al. (2006a) found DOA of 0.247% for broilers in the Czech Republic. Voslarova et al. (2006) reported the death rate of 0.279% of turkeys in transport in the Czech Republic, and Vecerek et al. (2006b) reported the death rate of 0.107% in pigs transported to slaughter plants in the Czech Republic.

The increase in mortality rates with longer transport distances to processing plants of broilers, turkeys and pigs has been studied by Vecerek et al. (2006a,b) and Voslarova et al. (2006), respectively. Warriss et al. (1999) studied the effects of lairage time on body temperature and glycogen reserves of broiler chickens held in transport modules. They found that the body temperature of broilers increased with the time they were held in lairage. Savenije et al. (2002) studied the effect of feed deprivation and transport on preslaughter blood metabolites. Nijdam et al. (2005) investigated some biochemical parameters, including levels of corticosterone, glucose and lactate. They found that plasma levels increased at the start of catching, and they further increased during transport, shackling and stunning. Mitchell et al. (1992) studied haematological and biochemical stress indices in broiler chickens during road transportation. They

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reported an increase in heterophil/lymphocyte ratios and plasma creatine kinase activities and a decrease in eosinophil counts during the transport of broilers.

Factors causing significant stress load in poultry include the method of catching, rough handling, loading on a vehicle, density of poultry in transport, microenvironment in the transport vehicle and the season of the year. In their study of methods for catching poultry, Nijdam et al. (2005) compared the bruising and mortality, stress parameters and meat quality in manually and mechanically caught poultry. Mechanical catching was associated with higher numbers of birds that were dead on arrival (DOA). Mitchell and Kettlewell (1994) studied the potentially harmful effects of adverse environmental conditions during the transport of poultry. They found large thermal gradients and the existence of a thermal core in moving vehicles. Kettlewell and Mitchell (1994) noted that manual catching, handling and loading of poultry prior to transportation to slaughter had been identified as major sources of stress and trauma to the birds. Bedanova et al. (2006) studied effects of various loading densities during transportation of broilers and concluded that stress connected with sudden change of microclimate conditions in crates induced strong changes in haematological indices. MacCaluim et al. (2003), who looked into the question of aversion of poultry to vibrational and thermal stressors in a continuous free-choice procedure, found that poultry significantly avoided the thermal stressor. Mitchell and Kettlewell (1998) examined the causes of thermal stress in poultry during transport. They concluded that an inadequate ventilation resulted in a heterogeneous distribution of temperature and humidity in vehicles and that the existence of a thermal core in vehicles increased the risk of a heat stress.

Other stress factors for poultry in transport mentioned by various authors include transport time, rough driving, distance and time of transport, unloading and lairage time in processing plants (Warriss et al., 1992; Mitchell and Kettlewell, 1998; Knierim and Gocke, 2003; Nijdam et al., 2004).

Zulkifli et al. (2001) found that the administration of ascorbic acid to broilers may decrease their stress load during transport.

The aim of our study was to investigate death rates of hens and roosters transported to slaughter plants, and to assess the effects of transport distances and the season of the year per individual months on the bird mortality.

MATERIAL AND METHODS

Between 1997 and 2004, veterinary inspectors in the Czech Republic recorded the mortality of hens and roosters related to their transport to processing plants, specifically the number of hens and roosters that died in transport vehicles or in processing plants shortly after arrival. Data from the whole of the Czech Republic were gathered in the database of the Information Centre of the State Veterinary Administration. The data were analyzed by software programme especially developed for the purpose that generated reports on the numbers of transported and dead hens and roosters according to parameters specified, and converted them to the Excel format for further statistical processing.

Transport distances were considered in five categories, i.e. less than 50 km, 51 km to 100 km, 101 km to 200 km, 201 km to 300 km, and over 300 km. For these distances, annual means of the number of hens and roosters transported and annual means of the number of hens and roosters that died in transport were calculated.

Mean monthly ambient temperatures at 7 a.m. in two locations typical for road transportation of animals (Olomouc and Tuhan) were established in cooperation with the Czech Meteorological Institute.

Results were processed using the statistical calculations module of the Excel software package.

RESULTS

In the Czech Republic, shipments of 45 100 585 hens and roosters to processing plants were monitored over a period of 8 years, of which 401 804 birds died. Mean annual death rates of hens and roosters and the effects of transport distances on mortality of the birds transported to slaughter plants are given in Table 1.

It follows from Table 1 that the overall mean annual death rate of hens and roosters related to their transport to processing plants for the entire period was 0.925 ± 0.479%. The effect of transport distance increased the death rate of hens and roosters shipped to processing plants from 0.592 ± 0.575% for transport distances below 50 km to 1.638 ± 0.952% for transport distances between 201 and 300 km.

Effects of the season of the year per individual months on death rates of hens and roosters transported for slaughter and mean monthly ambient temperatures are given in Table 2.

Table 1. Mean annual numbers of hens and roosters that died during transport to processing plants in relation to travel distances

Transport distance (km)	Number of hens and roosters transported		Number of hens and roosters that died in transport		Percentage of hens and roosters that died in transport	
	mean	sd	mean	sd	mean	sd
< 50	1 799 200	220 898	10 843	11 465	0.592	0.575
51 to 100	1 428 420	453 389	10 369	2 703	0.764	0.213
101 to 200	1 448 841	244 687	15 285	8 241	1.053	0.547
201 to 300	604 339	185 386	9 720	5 084	1.638	0.952
> 300	356 773	400 810	4 009	4 667	0.911	0.879
Total	5 637 573	572 905	50 226	19 562	0.925	0.479

sd = standard deviation

It follows from Table 2 that seasonality shown here month by month influences the number of hens and roosters dying during transport. The highest mortality rates were ascertained during the cold months of the year, i.e. in October, November, December, January, February, March and April, when temperatures did not exceed 10°C.

DISCUSSION

Poor welfare during hen and rooster transport may result in an increase in the number of birds dead or injured on arrival at the slaughterhouse (Knowles and Broom, 1990), change in body temperature (Warriss et al., 1999), alterations in bio-

Table 2. Mean monthly numbers of hens and roosters that died during transport to processing plants and mean monthly ambient temperatures

Month	Number of hens and roosters transported		Number of hens and roosters that died in transport		Percentage of hens and roosters that died in transport		Ambient temperature in individual months (°C)	
	mean	sd	mean	sd	mean	sd	mean	sd
January	798 382	98 460	9 652	5 951	1.222	0.835	–2.6	1.9
February	442 514	130 180	4 299	2 527	1.005	0.617	–0.8	2.6
March	353 503	109 341	2 869	2 369	0.819	0.638	1.8	1.1
April	495 664	123 882	5 871	4 497	1.153	0.774	6.6	1.6
May	684 277	99 363	4 765	2 913	0.692	0.443	13.1	1.4
June	755 047	210 059	5 226	2 273	0.710	0.251	15.8	1.4
July	459 928	66 800	3 569	1 577	0.790	0.359	16.9	1.0
August	403 699	89 943	2 070	1 065	0.525	0.284	16.6	1.0
September	288 562	59 944	1 985	1 524	0.692	0.502	11.1	1.1
October	264 972	85 878	2 466	3 234	0.865	0.908	6.9	2.1
November	238 418	72 511	2 567	2 099	1.132	1.031	2.5	1.8
December	452 610	147 643	4 887	3 280	1.134	0.852	–1.3	2.2

sd = standard deviation

chemical indices of stress loads (Savenije et al., 2002; Nijdam et al., 2005), or haematological indices of stress loads (Mitchell et al., 1992).

The mean DOA percentage of hens and roosters found in our study was 0.925%. This figure is higher than values reported by Gregory and Austin (1992), Nijdam et al. (2004) and Vecerek et al. (2006a) for broilers, Voslarova et al. (2006) for turkeys and Vecerek et al. (2006b) for pigs. The DOA of hens and roosters is an important value that demonstrates deficiencies in hen and rooster welfare during their transport to poultry processing plants.

Transport of hens and roosters over long distances up to 300 km coincided with higher DOA figures. The DOA of 0.592% for transport distances below 50 km increased to 1.638% for transport distances between 201 and 300 km. These results corroborate the findings in broilers published by Warriss et al. (1992), who noted that longer journeys to processing plants are associated with higher mortality in broiler chickens. Our results, however, have demonstrated a much greater transport-distance related increases in DOA among hens and roosters than those reported by Warriss et al. (1992) and Vecerek et al. (2006a) among broilers, Voslarova et al. (2006) among turkeys and Vecerek et al. (2006b) among pigs.

In cold months, increased death losses during transport to processing plants were recorded. Compared with broilers, where Mitchell and Kettlewell (1994) found large thermal gradients and the existence of a thermal core within moving vehicles in summer and in winter, and Vecerek et al. (2006a) found increased broiler mortality in both summer and winter months, higher mortality of hens and roosters was found in colder months only.

The number of hens and roosters dying during transport to processing plants could be reduced. It follows from our study that a factor that might help to significantly reduce death losses of hens and roosters in transport is a reduction of the transport distance. Also reducing the exposure of hens and roosters to climatic conditions may help decrease death losses during transport, particularly during cold months. Other factors that affect mortality of poultry shipped to processing plants include the method of catching (Knierim and Gocke, 2003; Nijdam et al., 2005), handling (Kettlewell and Mitchell, 1994), thermal stress (MacCaluim et al., 2003), density of animals during transport, live weight, breed, time spent in transport, lairage time at the processing plant (Warriss et al., 1992; Mitchell and Kettlewell, 1998; Nijdam et al., 2004; Bedanova et al., 2006) and also the administration of ascorbic acid (Zulkifli et al., 2001).

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