

# INFLUENCE OF DIFFERENT CONDITIONS OF TRANSPORTATION AND PRE-SLAUGHTER HANDLING ON QUALITY INDICES OF PORK

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## SUMMARY

This paper reviews the influence of transport conditions on pigs welfare, yield and quality of meat and its technological properties.

### Introduction

Selection of optimum transportation conditions and pre-slaughter handling are one of the main factors leading to reduction of the waste of valuable produce and preservation of meat quality at the stage of distribution of animals. Journey duration, extreme weather conditions, loading of pigs of different sex and age on lorries, noise, vibration and a lot of other factors aggravate the unfavourable influence of transportation on physiological state of pigs. Stress on organisms of animals cause mortality of pigs; the figure may reach 4%. Depending on duration of journey the losses of live weight in the case of pigs are from 7 to 11%. The losses of produce persist to increase during animals pre-slaughter fasting at meat-packing plants (Tatulov, Bortkevich, 1990). Unfavourable factors of pre-slaughter handling lead to an increase of incidence of PSE meat, particularly in the case of pigs, raised and fed according to intensive technologies (Tatulov et al., 1984).

### Materials and Methods

The objects of the investigations were pigs of Large White breed, their sides and meat as produced after slaughter.

The animals were supplied from the industrial complex of intensive technology of fattening and raising "Afanasyevsky" of Lipetsk region. Killing of pigs was accomplished both at meat-packing plants, located at a distance of 50 and 100 km from husbandry, and directly at husbandry. These animals were transported under similar conditions in vehicles for cattle transportation, on roads with rigid covering, at an ambient air temperature +15°C. The pigs were kept during 6 hours before slaughter. To study the influence of different periods of pre-slaughter keeping at a base of a meat processing plant on losses of produce, three groups of pigs, 5 to each, were formed, these groups being delivered in the same vehicle at a distance of 50 km. Both at the husbandry and at a meat-processing plant each pig was weighted separately. The pigs of similar live weight were selected. They were killed by electric stunning.

Actual changes of live weight, a mass of the content of gastrointestinal tract, carcass yield, a liver mass, as well as the quality characteristics of muscle tissue were determined during control processings.

The main indices, characterizing meat quality and its technological properties were determined on *M. long. dorsi*. The assignment of meat to groups PSE, DFD and N was done according to measured values of pH of hot meat (pH<sub>1</sub>) and of the meat, chilled during 24 hours (pH<sub>24</sub>). pH value was determined by Ph-meter (TMG-ULTRA X, type 3002, Germany), directly on the carcass and on *M. long. dorsi*; water-holding capacity and colour intensity were determined by commonly used methods. The water-soluble and salt-soluble proteins of muscle tissue were determined according to Krylova and Lyaskovskaya, 1965. (The work was carried out jointly with the specialists of Research Institute of Breeders' Service).

## Results and Discussion

Data on the influence of distance of transportation of pigs on quantitative and qualitative indices of produce are presented in Table 1. It was found that as the distance of transportation increases to 100 km, general losses of live weight of pigs increase from 1.3 to 1.6%, in this case only 0.4% are due to feces, whereas the real mass losses of the animals of the second group are 0.9%, and of the third group - 1.2%. The transportation of pigs to the distance over 50 km increases the real losses of bone-in meat. Thus, the carcass yield of the animals of the second group as compared to the yield of the pigs, killed directly in husbandry (no transportation at all) decreases by 2.1% and for the third group by 3.6%. As the distance of transportation increases, the weight losses of carcasses during their 24 hours chilling period also increase from 0.6 to 1.1%. The mass of liver is one of the important characteristics to determine the extent to which the animals are subjected to stress. The distance of animals transportation of 50 and 100 km results in a decrease of yield of the liver by 0.74 and 0.85%, respectively (as compared to the animals killed directly at the husbandry).

The influence of conditions of transportation on the characteristics of muscle tissue are presented in Table 2.

The investigations of the samples of *M. long. dorsi* after 24 hours of carcasses chilling have pointed out to a decrease of physical and chemical characteristics of muscle tissue, as the distance of animals delivery increases. In the meat from the animals of 2<sup>nd</sup> and 3<sup>rd</sup> groups quality defects were observed (meat PSE): the initial pH value of this meat is as low as 6.0 and 5.9; the values of water-holding capacity of proteins are decreased from 89.4 to 72.8%; the meat colour is more pale.

By studying the amount and relation of complete and incomplete proteins in meat we tried to find out the influence of transportation on changes in biological value of meat (Table 3). Analysis of results, shown in Table 3, indicates that the increase of distance of transportation is an unfavourable factor: in the meat of animals of 2<sup>nd</sup> and 3<sup>rd</sup> groups the amount of sarcoplasmic and myofibrillar proteins decreases, the relative amount of proteins of stroma increases, and as a consequence of this the quality index of meat proteins decreases by 0.2 and 0.6 units, respectively.

The analysis of data shown in Table 4, indicates that with the increase of keeping time of pigs up to 24 hours before slaughter the losses in live weight increase, mainly due to the content of gastrointestinal tract, and constitute for the animals of the third group - 1.5% against 0.39% for the animals of the second group. The greatest yield of the carcass (54.3%) is in the case of pigs, killed immediately after arriving at a meat-packing plant (slaughter "from the wheels") and the least (53.6%) for the pigs kept before slaughter for 24 hours. The mass of the liver for the animals, killed after a 6 hours keeping period is practically similar to that of the animals killed "from wheels". After pre-slaughter keeping during 24 hours, the mass of liver decreases by 0.1-0.2%.

Table 5 shows physico-chemical indices of the meat of pigs kept for different periods of time before slaughter. The meat of the animals of 2<sup>nd</sup> and 3<sup>rd</sup> groups by all the indices may be attributed to PSE-meat. The pH value is very low which points out to the accumulation of lactic acid immediately in hot meat, there are no processes of glycolysis at all, that does not ensure the normal process of meat ageing. This meat possesses low water-holding capacity (69.7 and 63.5%) and is pale.

Among the real meat losses, the proteins of muscle tissue, determining the biological value of meat, are of great importance. The study of fractional composition of muscle protein (Table 6) shows that a 24-hour pre-slaughter keeping of animals leads to a decrease of the content of complete proteins (they decompose under the influence of unfavourable ambient conditions): in the meat of animals killed "from wheels" a sum of sarcoplasmic and myofibrillar proteins is 12.5%; proteins of stroma - 7.2%; quality protein index - 1.7; the sum of complete proteins is as low as 9.6%; the relative amount of incomplete proteins rose to 9.2%.

Based on the results obtained, we may conclude that a 24-hour pre-slaughter keeping of animals is a definite stress factor for pigs. Keeping the animals in lairages for 24 hours without feeding causes the increase in the losses of live weight, carcass weight and liver, as well as a reduction in the yield of valuable produce and its biological value.

## Conclusions

The increase of distance of transportation of pigs up to 100 km and time of pre-slaughter keeping of pigs up to 24 hours are not scientifically grounded and inefficient, as this leads to a decrease of qualitative and quantitative indices of valuable produce.

## References

1. Krylova N.N., Lyaskovskaya Ju.N. (1965). Physical and chemical methods of investigations of animal produce. M. Pischevaya Promyshlennost. Russia.
2. Tatulov Yu.V., Kuritsin N.I., Nemchinova I.P., Mittelstein T.M. (1984). Peculiarities of quality of raw materials of meat industry coming from animal complexes. M. TsNIITEImyasomolprom of USSR. Review information.
3. Tatulov Yu.V., Bortkevich L.L. (1990). Transportation and stress of pigs. M. AgroNIITEImyasomolprom. Review information.

Table 1. General losses of produce as dependent on distance of delivery.

Table 2. Physical and chemical indices of *M. long. dorsi*, n=5.

Table 3. Influence of distance of transportation on functional composition of protein of muscular tissue, n=5.

Table 4. Influence of pre-slaughter keeping period on slaughter characteristics of pigs.

Table 5. Technological properties of pork from animals, kept for different time periods before slaughter, n=5.

Table 6. Influence of pre-slaughter keeping time on fractional composition of muscular proteins, n=5.