

THE STRESS SYNDROME AND MEAT QUALITY
SESSION D: HANDLING, TRANSPORT AND SLAUGHTER

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Introduction

In this section one could expect that the latest scientific findings regarding the treatment and its effect on the animal during transport and slaughter could be brought together.

Most of the nine papers which have been sent in cover several aspects of the three mentioned topics of this section. D1, D2, D5 and D8 concentrate mainly on Transport whereas D3, D4, D7 and D9 deal more or less with the Stunning procedure as the main subject. Paper D2 also produces data about stunning methods.

These topics have been on the list of several European Meetings of Meat Research Workers before.

D6 is a paper on fat as an important factor in the meat trade and has in my opinion little to do with the other papers.

Transport conditions

The papers of the first group (D1, W.M. Allen and L.P. Smith; D2, P.A. Barton; D5, G.Schiefer and E. Scharner; D8, D.M. Teternik, V.S. Avsyukevitch and N.A. Polevodov) have of course common parts and differences.

D1, D5 and D8 deal with the influence of the transport on the animal and its slaughter condition.

In D1 statistical data are given on transport loss mainly of one factory in the period '61-'73. The same conclusions in regard with the higher death loss due to a higher ambient temperature are given as in earlier meetings. No clear evidence was found of the distance as a provoking factory. The lower data than those reported in some European countries do not make it wise to consider a substantial capital investment in order to decrease these losses.

In the discussion the author points out that the use of tranquillizers have no sense at least in Great Britain (mostly due to the regulations). The fact that breed differences exist makes it clear that the right breeding measures might

be an important tool to lift the burden of these losses for the pig industry. The author concludes with a series of logical recommendations (1).

In paper D8 the symptoms of stress after a long transport in Russia, which consist of restlessness, tremors, higher body temperatures, increased heartfrequencies have been evoked by injections of epinephrine. This was done in pigs and in cattle. These stress symptoms are registered in 1.93% in pigs and 1.65% in cattle. The authors made the very important observation that in these stressed animals the meat and other organs were often bacteriological contaminated. By a restperiod of about 24-48 hours this contamination disappeared. After a period of three hours the stress symptoms still existed.

In paper D5 the authors present figures about heart frequencies in pigs which have been influenced by certain factors such as distance and the way of driving. In fact here one of the parameters of stress mentioned in paper D8 (increased heartfrequency) is used (3). Furthermore the pH of the meat 24 hours postmortem was substantial higher after a longer distance (60 km against 10 km). Contrary to the expectation the meat showed instead of a darker colour (DFD) a lighter one (PSE). A given rest period did not improve the situation at all. This brings into the picture the importance of the relation between rest and quality (bacterial contamination, colour, pH and waterbinding capacity).

Allen (D1) and Barton (D2) propagate a slaughtering after transport as soon as possible.

The Russian authors from paper D8 gave evidence about the favourable influence of rest on the contamination of meat.

In Holland Verdijk made very extensive observations with a large number of pigs. He made recommendations for a restperiod of 2 hours on basis of pH₁ measurements (4).

Stunning and slaughter conditions

The second group of papers (D3, N.M. Krekhov, P.P. Veselova, A.A. A.A. Belousov and V.I. Plotnikov; D4, E. Scharner and G. Schiefer; D7, P.J.V. Tarrant; D9, V.N. Zhoulenko) concentrate for a large part on stunning and its effect on the meat quality. One gets the impression that not much systematic research takes place in this area.

In the paper D3 different electrical frequencies (50, 300 and 600 cycles/second) have been compared as to its effect on the muscle post mortem. They mention the occurrence of bond fractures especially after feeding beets (Ca oxalate?). Several histological criteria are used to study the changes post mortem. Although after the highest frequency no blood residue was observed, the organs showed more of these micro blood splashes. Rigor and ripening in general was greatly enhanced probably due to lysosomes damage.

This paper is rather close to paper D9. Here succinylcholine a muscle relaxant was applicated just before electrical stunning (no voltage and electrical frequency cycles). This treatment was compared with stunning with and without heart functioning in respect of slaughterblood production, protein and fat digestibility. The authors are in favour of the use of a muscle relaxant. Not only the breakdown of this component postmortem assures no chemical residues but also the slower portmortem decline of ATP gives a higher waterbinding capacity together with a higher blood yield (14.5 kg versus 12.05 kg with the stunning resulting in no more heartbeating).

In the first paper a rapid ripening was regarded as an asset while in this paper the slowing down of the postmortem muscle metabolism is also mentioned as a favourable effect.

In D4 results of investigations from 1968-1970 with pigs are presented. Bloodpressure, heartfrequencies and ECGs were used in order to study the effect of stunning and other slaughter conditions. Stunning provokes a very rapid increase of bloodpressure which disappears immediately after stabbing. Barcosis inhibits this increase completely.

ECGs have been registered until 26 minutes after the clinical death of the animal. In my opinion it is rather doubtful whether these methods are appropriate for a reliable discrimination and interpretation between those conditions which have been studied.

The effect of electrical stunning on the pH fall has been reported in former meetings. The strong muscle contractions should induce an accelerated postmortem metabolism c.q. pH fall c.q. PSE. Tarrant (D7) could not find evidence for this presumption in comparing the pH₁ of different slaughterhouses with and without stunning. He concluded that the introduction of stunning did not produce more PSE. This conclusion is in my opinion

obscured by the fact that other conditions such as carcass grade, fighting and excitations before slaughter had a very clear effect on the variability of the pH_1 reading between the different slaughterhouses. Furthermore the comparisons took place at different days. The results give a good indication about the variability of the Irish meat quality.

The paper D2 covers the field of the two mentioned categories. The importance of a standardized transport and slaughter treatment is stressed especially when information about the meat quality for genetic use is necessary. It is interesting to notice that a longer distance diminishes the number of PSE but does increase the DFD percentage. CO_2 increases PSE as well as DFD which is due to more exhaustion and excitation. The use of a restrainer had a negative effect on the meat quality. The investigations presented in this paper is a good example of the badly needed systematic approach in order to pinpoint the most important stressfactors.

As I have said before paper D6 (Schon) has little to do with the former reports. The author brings to the attention the fact that the real fat content in kg in the carcass is hardly taken into consideration in the meat trade. If only meat is wanted fat is shipped along with the meat.

If more figures existed about the real fat and bone content of different grades in carcasses of pigs and cattle then the real meat content was better estimated. In that case a more directed, hygienic and economical meat trade is possible in the future.

Summary and Conclusion

Looking at the most important outcomes of the papers presented in this section I can say that progress in this field is very slow. Not much new evidence is presented in respect with transport and stunning.

The Danish work provides the best avenue for a better control of the conditions for animal (pigs) and man. The human factor is in this respect very important. Therefore we must keep in mind that what the best is for the pig should also improve the condition for the man who has to do the job. Bad stunning can be improved by better methods but also by better handling the stunning apparatus.

In transport as well as during the slaughter procedures several steps can be subjected to automatisation. Research has to be directed in these ways. We mention in this respect hydraulic lifts, container transport,

the combination of restrainer and automatic stunning (2).

There is an interaction between the physical condition of the animal and the effect of the handling on the ultimate meat quality. Rest might be an important factor in order to restore the adaptability of the animal.

Therefore the conclusions drawn from figures of animals which were slaughtered immediately after transport might be quite different when these animals had gotten a period of rest. Therefore not only genetic measures have to be taken in order to improve the adaptability of the animals. More systematic research is urgently needed in the field of the conditions of the animal during transport and stunning.

I hope that the discussions about the work presented in the other sections produced conclusions which will prove to be of benefit for the discussion about the papers brought forward in this section.

Literature

1. Lendfers, L.H.H.M.; Gevoeligheid van het Nederlandse slachtvarken voor transportinvloeden. (Sensitivity of the Dutch slaughter pig to transport). Thesis Utrecht, 1974.
2. Putten, G. van: Eine strukturelle Aenderung beim Transport der Schlachtschweine. Hulsenberger Gesprache 1973. Hamburg, V.T.N., 1973. pp. 105-107.
3. Schon, L.: Einfluss des Vermarktungs- und Schlachtprozesses auf die Gewebebeschaffenheit von Schweinefleisch. Die Fleischwirtschaft 54 (1974) 3: 544-549.
4. Verdijk, A.Th.M.: Oorzaken van afwijkende vleeskwaliteit bij stressgevoelige varkens. (Causes of aberrant meat quality in stress-susceptible pigs). Thesis Utrecht, 1974.