REVISION OF CURRENT MEAT INSPECTION: WHY AND HOW?

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SUMMARY

The efficiency, cost effectiveness and scientific validity of current ante and post mortem meat inspection procedures are doubtful. The detection rate of abnormalities through on-line inspection, palpation and incision of carcases is low, and the abnormalities that are present in animals from industrialized countries are more related to the aesthethic or technical quality of products than to public health aspects. Moreover, current meat inspection was never designed or equipped to detect symptomless carriers of zoonotic agents, residues of veterinary drugs or environmental contaminants. Current meat inspection is also ineffective with regard to the control of hygiene during slaughter and further processing.

Experiences in the Netherlands and Denmark regarding Integrated Quality Control (IQC) in animal husbandry have shown that the animals delivered and the meat produced are of a better quality and safety standard than non-IQC produced animals and meat. With an IQC-system current meat inspection procedures could be simplified, thus allowing meat inspection authorities to shift their attention much more towards hygiene control.

However, because there is a lack of knowledge about the actual magnitude of human health hazards to be associated with the production and consumption of meat, such alterations should only be considered as a first step in the modernization of meat inspection. For a really effective and long-term change to the system, it is absolutely necessary that any further modernizations be based on formal quantitative assessments of risks.

INTRODUCTION

Although the quality of products, production systems and animal welfare may not be neglected, ensuring the safety and wholesomeness of meat may be considered as the main objective of meat inspection. Western European meat inspection procedures are thereby aimed at the detection and exclusion of animals and parts of animals without: 1) Pathological anatomical abnormalities; 2) Pathogens; 3) Residues of veterinary drugs; 4) Residues of environmental contaminants; 5) Contamination during processing.

However, the efficiency, cost effectiveness and scientific validity of current ante and post mortem meat inspection procedures in the industrialized countries are nowadays seriously being doubted (2,9,10,12-15).

Furthermore, the responsibility for the quality and the safety of meat cannot entirely lie with the meat inspection service. With respect to this, the suppliers of the animals have also a certain responsibility.

This paper discusses the main reasons for these doubts and tries to point out along which lines revisions of the current system of meat inspection should take place. It also points out how suppliers and producers should acquire more responsibility with respect to the safety and quality of animals and meat produced.

WHY A REVISION OF THE CURRENT SYSTEM?

The current meat inspection system can be divided in an ante mortem and a post mortem inspection. The ante mortem inspection is, in fact, a simple clinical examination. Post mortem inspection is a simple pathological-anatomical examination. Because of its laborious nature, it is also the most expensive part of meat inspection.

In the industrialized countries improvements in technology, animal husbandry and animal health care have led to a significant rise in the numbers of animals kept for animal production, while this production has also become more and more concentrated in large production units and certain regions. Thus, the slaughter of a few animals, originating from the same farm, has evolved into the slaughter of large numbers of uniform, relatively young and healthy animals, often with a common genetic background (2).

Furthermore, zoonotic diseases that lead to characteristic pathological-anatomical changes in slaughter animals, such as tuberculosis and anthrax, have also become sporadic in such countries. Current zoonotic public health hazards in the industrialized countries are agents that can be carried by animals without symptoms, such as Salmonella, Campylobacter and Yersinia (2). Modern animal husbandry seems to facilitate the presence of these bacterial zoonotic agents. Meat inspection, however, was not designed and equipped to detect these agents. Some inspection procedures, i.e. the incision of lymph-nodes, can even have a negative effect on the safety and quality of meat.

In addition, it is doubtful whether on-line inspection, palpation and incision are sensitive enough methods to detect all abnormalities that are present in an animal. Reported observations show relatively low sensitivities that vary from less than 20% for the detection of Cysticercus bovis to 41 % for the detection of cysts of Taenia ovis in lambs (2). Also, abnormalities with a low prevalence are more often missed by meat inspectors than abnormalities with a high prevalence (5,6).

Veterinary drugs are administered "on purpose" in animals. The owner knows, or should know, that his animals were treated. Checking and controlling whether animals have been treated is possible, but this is very costly and time consuming. The current system gives no absolute guarantee that virtually all delivered animals will be free of residues. That is why it is necessary to develop a system that can guarantee the absence of residues. In this system the producer should bear the responsibility for this, and profitability should be the main incentive for voluntary cooperation (bonus-malus).

Regarding the presence of environmental contaminants, the farmer can mostly not be blamed. Therefore, countrywide surveillance programmes are necessary to obtain insight in these matters. Based on the results of the surveillance programmes, direct action can be undertaken and intervention strategies designed.

On the grounds of the number of foodborne infections in human populations, it must be concluded that meat inspection services should pay considerably more attention to hygiene control during slaughtering, dressing and further processing than they do now. This, however, needs a highly developed safety and control system.

Regarding the development in safety and control systems during production and processing of meat, four stages can be distinguished:

1. *Passive control stage*
   At this stage, there is no specific system for controlling the end product. If there is something wrong with the end product, the buyer will complain and as a result of this the seller will probably lower his price and promise that it will not happen again. The consequences are that production costs a lot of money and improvements in safety and quality will fail to appear.
2. *End product control stage*
   Hereby, every individual product is checked and will be rejected if abnormalities are detected. The failure costs in this system are high, and if there is no feedback to prevent the diagnosed abnormalities, nearly the same percentage of the next production charges will be rejected or condemned. Many production lines work in this way. In this stage the control is focused on the end product and not on the production system itself.
3. *Process control stage*
   In a process control system the checking procedures are focused on the production line itself. In the food industry this approach is also known as the Hazard Analysis Critical Control Point (HACCP) approach. For each critical point Codes of Good Manufacturing Practices (GMP), control procedures and criteria that have to be met are created. Thus ensuring a production with a controlled constant level of safety and quality.
4. *Integrated Quality Control (IQC) stage*
   In an IQC approach attention is not only focused on the production line itself, but also to the production system as a whole: from stable to table; from conception to consumption. Each participant in this chain has his own responsibility. The exchange of relevant data between the links of this chain enable a constant optimization of production, and thus of quality and safety.

With respect to this, it can be stated that meat inspection must be considered as a system that is working as an "end product control" of the production of slaughter animals, leading to higher failure and labour costs than are necessary. Moreover, because there is no structural feedback of relevant data, meat inspection does not contribute much to improvements in the quality and safety of the delivered animals, or, for that matter, the profitability of animal production.

Information about the presence of post mortem abnormalities in particular, could help farmers to improve the quality and safety of their livestock. Data obtained from the registration of post mortem abnormalities could also be used in epidemiological studies and risk analysis. In the Netherlands and Denmark the experiences with integrated quality control systems, especially in pork production, have proven that such systems can lead to a better quality and safety of animals and meat produced. (1-3,5-8,11-15).

HOW TO REVISE THE CURRENT SYSTEM?

Based on the results of the field trials regarding the IQC approach, the following system is now applied in practice in the Netherlands (10,15).

The Dutch Product Board for Livestock and Meat has set up general rules for Integrated Quality Control in finishing pigs, which have to be fulfilled by the participants. Those rules are supervised by an independent organisation. At the moment this is done by National Council for Applied Scientific Research (TNO) and the International Control Company (ICM). Until 1993 thirteen Dutch slaughterhouses were certified by these organisations, and approximately three million pigs have been produced with this IQC system.

The basic rules for taking part in the IQC system are:

1. Adequate identification and registration of the animals.
2. Only specified veterinary drugs (positive list) and feeds may be used during the fattening period and the required withholding period must be strictly obeyed.
3. Veterinary practioners must act according to the Code of Good Veterinary Practice. This means that they may only use the specified drugs. Their signatures should also be a guarantee for their correct application. Only veterinarians who are willing to work under contract will be allowed to treat the IQC animals for these cooperations.
4. The farmers must feed their animals only with feed manufactured byproducers who fulfil the requirements of Codes of Good Manufacturing Practices in the feed industry.
5. All treatments and transactions must be registered in a health logbook.
6. All animals must be delivered with a Quality Information Card. This card contains the most important information of the logbook and can be considered as a specific guarantee certificate.
7. The meat inspection service registers relevant pathological anatomical abnormalities.
8. The slaughterhouse has to feed back the information regarding these pathological anatomical abnormalities to the farmer.
9. The slaughterhouse fulfils a central role in the IQC system and the mutual exchange of information. The slaughterhouse is responsible for ensuring that every link in the meat production chain complies with the IQC-regulations.
10. The farmer must give absolutely reliable information about his production. If the supplied information appears to be incorrect, the farmer will no longer be allowed to take part in the IQC system.
11. Twice a year both an internal and an external audit have to be carried out.

According to art. 17 of the new EC Directive Fresh Meat 91/497/EEC revision of meat inspection procedures for uniform deliveries is allowed, when this new method ensures a level of safety equivalent to that guaranteed by existing ante and post mortem inspection procedures.

A proposal for some revisions of current EC meat inspection procedures regarding pigs, has been presented into the Commission in Brussels, is in preparation. The proposal is based on the aforementioned rules of the IQC system with some additional recommendations. In this proposed system the producer of slaughter

animals will be responsible for the wholesomeness and quality of the whole production he delivers. Batches without guarantees require rigid meat inspection of individual carcasses, which means higher costs for the farmer (malus). If the farmer can and does guarantee that the additional requirements are met, his effort will be rewarded (bonus).

In addition to the basic IQC rules, the farmer must preselect his animals on visible abnormalities (7). Furthermore, he has to guarantee that the pigs, when delivered, are healthy and have no visible pathological anatomical abnormalities. This should be ascertained with a "meat inspection index", which is the total sum of the percentages of the registered abnormalities in a delivery. This meat inspection index has to be stored in a databank so that the average quality of the deliveries of the producer can be assessed. Finally the animals should be delivered to the slaughterhouse separately from animals that are not guaranteed, thus preventing the mixing up of IQC and non-IQC animals.

If those conditions are fulfilled, the traditional meat inspection can be replaced by a visual post mortem inspection without palpation or incision (2,8). Consequently, the meat inspection services can shift their attention much more towards the control of hygiene during processing. Preconditions must be that the rules of the Codes of Good Manufacturing Practices (GMP) are followed and that the production process is under control (HACCP approach).

In this way it seems possible to adapt current meat inspection from (end)product control to production control, resulting in lower costs and better guarantees for the consumer.

However, the above described changes must be seen as the first step of the modernization of meat inspection. For an effective change to the system it is necessary to undertake a quantitative risk assessment. This is because the above described changes do not solve all of the systems fundamental disadvantages (2). For example, it will still not be able to be flexible and adapted to any specific demands that certain categories of slaughter animals or certain regions or countries may have. Neither will it be able to adapt itself continously to changes in circumstances regarding animal husbandry and health, prevalent zoonoses, veterinary drugs used orenvironmental contaminants.

Such a system can only be designed and maintained on the basis of a (continuous) formal (quantitative) risk analysis. This risk assessment will have to include an assessment of all sorts of risks that can be associated with the production and consumption of meat; the determination of the relative magnitude of all assessed risks so that priorities can be made; the assessment of the timing and procedure by which interventions should be effective in reducing or eliminating these risks; and the design of objective criteria with which the succes of the interventions made can be assessed. For this, reliable epidemiologic data concerning zoonotic agents in slaughter animals, and the incidence of human disease caused by those agents are needed.

When a formal quantitative risk assessment has taken place for every region or country involved, it will be possible to design a system of meat inspection that can adapt itself to the circumstances as they occur in these different regions. Furthermore, the system does not have to be identical for all these different regions (2,9).

In addition, a fundamental question connected with this is how much public authorities should be involved with the inspection of matters that concern the aesthetic or technical quality of products more than public health aspects, as it appears to be the case with the inspection of pathological anatomical abnormalities in animals from healthy populations of highly developed countries.

It may well be that the results of a risk assessment will show that a majority of currently executed procedures could be omitted or carried out by the industry itself, supervised by the competent national veterinary authority. After all, many "high risk" industries, e.g. the pharmaceutical and aeronautical industries, bear the responsibility for the safety and quality of their products themselves, and the role of the authority is thereby restricted to verification of certain legal specifications.

References

Berends B.R., Smeets J.F.M., Harbers A.H.M., Van Knapen F. and Snijders J.M.A. Investigations with enzyme-linked immunosorbent assays for Trichinella spiralis and Toxoplasma gondii in the Dutch 'Integrated Quality Control for finishing pigs' research project. Veterinary Quarterly 13, 190-198, 1991.

Berends B.R., Snijders, J.M.A., Van Logtestijn J.G. Efficacy of current EC meat inspection procedures and some proposed revisions with respect to microbiological safety: - A critical review. Veterinairy Record 133, 411-415, 1993.

Elbers A.R.W., Tielen M.J.M., Snijders J.M.A., Cromwijk W.A.J. and Hunneman W.A. Epidemiological studies on lesions in finishing pigs in the Netherlands. I. Prevalence, seasonality and interrelationship. Preventive Veterinary Medicine 14, 217-231, 1992.

Gerats G.E.C. Working towards Quality. Aspects of quality control and hygiene in the meat industry. Thesis, University of Utrecht, 1990.

Harbers A.H.M. Aspects of meat inspection in an Integrated Quality Control system for slaughter pigs. Thesis, University of Utrecht, 1991.

Harbers A.H.M., Smeets J.F.M. and Snijders J.M.A. Registration on post mortem abnormalities of pigs in the slaughterline. Fleischwirtschaft 72, 160-163, 1992.

Harbers A.H.M., Elbers A.R.W., Geelen A.J., Rambags P.G.M. and Snijders J.M.A. Preselection of finishing pigs on the farm as an aid for meat inspection. Veterinary Quarterly 14, 46-50, 1992.

Harbers A.H.M., Smeets J.F.M., Faber J.A.J., Snijders J.M.A. and Van Logtestijn J.G. A comparative study into procedures for post mortem inspection for finishing pigs. Journal of Food Protection 53, 620-626, 1992.

Hathaway S.C. and McKenzie A.I. Post mortem meat inspection programs; separating science and tradition. Journal of Food Protection 54, 471-475, 1991.

Hathaway S.C. and McKenzie A.I. Risk analysis and met hygiene. Proceedings of the 11th International Symposium of the World Association of VeterinaryFood Hygienists, Bangkok, 24-29 October, pp 38-45, 1993.

Schouwenburg J.N., Van Logtestijn J.G., Paardekooper E.J.C. and Snijders J.M.A. Integrated quality control in the Dutch pig sector. Proceedings of the 39th International Congress of Meat Science and Technology, Calgary, 2-6 August, 1993.

Snijders J.M.A., Smeets J.F.M., Harbers A.H.M. and Van Logtestijn J.G. Towards an improved meat inspection procedure for slaughter pigs. Proceedings of the 10th International Symposium of the World Association of Veterinary Food Hygienists, Stockholm, 2-7 July. Satellite Symposium, pp. 22-25, 1989.

Snijders J.M.A., Smeets J.F.M., Harbers, A.H.M. and Van Logtestijn J.G. The evolution of meat inspection of slaughter pigs. Fleischwirtschaft 69, 1422-1424, 1989.

Snijders J.M.A., Schouwenburg J.N., Van Logtestijn J.G. and Berends B.R. Modernization of current meat inspection procedures. Proceedings of the 39th International Congress of Meat Science and Technology, Calgary, 2-6 August, 1993.

Snijders J.M.A., Van Logtestijn J.G. and Berends B.R. Integrated quality control and HACCP as prerequisites for a new meat inspection system. Proceedings of the 11th International Symposium of the World Association of Veterinary Food Hygienists, Bangkok, 24-29 October, pp 123-127, 1993.