

Future Challenge for Veterinary (Poultry) Meat Inspection

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1. Introduction

The original aim of meat inspection was – more than a century ago - to detect transmissible diseases and to prevent their spread, firstly introduced in Germany. Other countries took over and the idea was extended to other issues.

In the 70ies of the last century, meat inspection was introduced to the poultry production chain. Prior to introduction, a vivid discussion among Northern America and Europe took place, between the industry, the authorities and the scientific community. Quite early, the speed of the line raised concern on the reliability of inspection, i.e. the detection rate of birds to be removed from fast running lines, at that time about 3 – 5,000 birds/ h. Also controversy on the position of ante mortem inspection (at the place of origin or prior to slaughter in the abattoir) carried on for years.

Historically, meat inspection was in the very sense of the word an inspection of slaughter animals and post mortem necropsy. Today, former final product check done by the authorities is in a full swing to supervision of internal control done by the food enterprise.

This contribution touches issues of concern for further consideration.

2. Technology, hygiene, legislation of poultry meat production

2.1. Integration

Poultry production is a highly industrialised production chain with closely interlinked stages from primary production up to the final product and further on, it is much more integrated than mammal lines. Main stages of large scale poultry meat production are pre harvest, harvest, post harvest and processing (cutting line and further processed poultry meat products).

To run an abattoir at high speed (up to 12,000 birds/ h - broilers) requires sophisticated technology. Accordingly, in primary production we find large herds supplying these abattoirs. With ever growing line speed, plants are running in more than one shift, simultaneously the time for service (hygiene and technics) becomes shorter. Most unnecessary to stress the economic importance of such highly advanced lines.

2.2. Hygiene

Hygiene means containment of zoonotic agents during the whole line, steering the microflora of the carcass in the abattoir, prevention of foreign substances in primary production. Agents may be classified as zoonotic, as agents causing animal diseases or as those, which impact on shelf stability of the product.

The poultry food chain is strong with respect to technology and production efficacy. However, the dense technology goes without any hurdles for microbial agents, thus opening options for transfer via several carriers. Besides others, in particular the bird as such is the connecting link between primary production and processing. Most important weak points from the hygienic point of view are sites of cross contamination during scalding, defeathering, evisceration or chilling.

Microflora of the birds: The total aerobic plate count on poultry skin (broilers) is about log 4/ g skin. Bacteria regularly occurring in the processing line are Micrococcaceae, Enterococci, Irregular Nonsporing Grampositive Rods, Enterobacteriaceae. For such agents, the incoming bird is a source of contamination at different stages.

Also *foreign substances* are transferred via the birds (residues from legal veterinary application, as well as substances from environmental pollution).

Salmonella and Campylobacter: One pathway of pathogen bacteria into the human habitat leads via food of animal origin stemming from the farm. In connection with biological agents, the phenomenon of resistance in bacteria must be kept in mind also.

2.3. Legislation

Mandatory poultry meat inspection as amended by Reg. (EC) 854/2004 contains more general operation prescriptions as it was the case in the Directive 71/118/EEC). Ac. to Annex. I, Section IV Chapter V of Reg. (EC) 854/2004, the following has to be done:

Ante mortem:

Herds for slaughter may be inspected at the farm of origin (by decision of the competent authority). The inspection must be done by an Official or an Approved Veterinarian. In such cases, a health certificate based on insight into the log book including an inspection of the respective shipment (for transmissible diseases, possible causes for condemnations later on or for residues) must accompany the shipment to the abattoir. In such cases, the inspection in the abattoir may focus on the identity of the herd as well as a screening for animal wellbeing. When such an ante mortem inspection was not done at the site of origin, the OV must perform the ante mortem inspection at the abattoir. If the birds show clinical symptoms, they may not be slaughtered for human consumption.

In case of use of the poultry for foie gras or in case of production of poulet effilé, the ante mortem inspection must be done at the site of origin.

Inspection in the primary production consists of an inspection of the individual flock as well as insight into the history of the keeping period including the origin of feed stuff. It includes elements of clinical, pathological-anatomical as well as laboratory examination. Respective data are considered health relevant (average daily weight gain, mortality rate, initial number of one-day-chickens, feed and water consumption) as well as residue related data (administration of drugs, feed additives) and the immunisation record.

Post mortem:

Without delay, carcasses and respective offal ("all external surfaces") are to be inspected (Annex I, Section I). The OV carries out personally:

- Daily inspection of viscera and body cavities of a representative number of slaughtered animals
- For each batch, a detailed inspection of a random sample of parts or of entire carcasses having been declared unfit for human consumption
- Any other examination necessary when there is reason to suspect, that the meat from these birds could be unfit for human consumption

Post mortem meat inspection consists of an inspection on the line, done by auxiliaries in some, by veterinarians in other Member States.

The aim of meat inspection:

For years, discussion went on about content and aim of meat inspection in general. With red meat, some reserve meat inspection for human health purposes, some stated the mere qualitative character of poultry meat inspection. After recent amendment of EU- legislation, the scope should be clear:

- To ensure the safety of the product for human health (medication, zoonotic agents, occurrence of resistance)
- To obtain a product being correct with regard to ethical considerations and thus to keep it worldwide acceptable (animal welfare)
- To prevent the spread of animal diseases (zoonoses and animal diseases)

- To provide a wholesome product for human consumption

Legislative network:

By now, more than meat inspection legislation must be observed for the various animal food chains. The “hygiene package”, mainly consisting of several EU- Regulations between 2002 and 2005, covers the whole food chain, it’s basic and applied hygiene, and the surveillance of food animals and food from animal origin including microbiological, health related and technical parameters.

The “zoonoses- package” lays down step by step measures against zoonotic agents in the poultry chain. As an example, laying hen must be free of Salmonella by 17 November 2007, the date for broilers would be the 17 November 2008, and for turkeys the 17 November 2009. For residues, undertakers and veterinarians must consider the consequences of medication (Maximum Residue Level - MRL) as well as unwanted environmental contamination. Finally, the importance of animal welfare is still growing: More animal welfare rules are to be expected, concerning laying hen’s welfare or the question of pododermatitis.

3. Practical performance of post mortem meat inspection

With the new Regulation (EC) 854/2004, slaughter of animals with diseases is more strictly prohibited than it was before. So, we can assume, that only healthy birds come to slaughter, even more, as the health status of the herds in the EU is basically good. So, the value of information obtained by the instrument of “meat inspection” asks for discussion.

3.1. The meaning of lesions, or: What do they reflect?

Slaughtered birds are biological material and differ in a more or less narrow range. So do lesions, and consequently the final seizure depends on intensity, site, extension as well as the character of a lesion (infection or technical damage of the individual bird). Moreover, we do not always know exactly the meaning or the causative background of an observation. So, what inspectors use to remove from the line as unfit for consumption, remains to some extent decided on an individual base.

Assessment of lesions in poultry meat inspection in the sense of Risk Analysis is lacking, more would be welcome in order to focus on lesions which should be observed.

Estimations of poultry lesions have been done by several authors (FRIES 1990; JAKOB et al. 1998; BREMNER 1994). BISAILLON et al. (2001) classified 143 grossly detectable abnormalities and conditions (GDAC) with respect to their risk for consumers. Results indicate a need for more analysis on this field:

- Potential for human relevance not known (n=46)
- The agent has never been involved in human diseases (n=47)
- The agent must be identified (n=3)
- Risk Management- options necessary (n=37; in particular chemical substances)

3.2. Personal burden during post mortem inspection

A sophisticated machinery facilitates procedures at high speed. Still, with increasing line speed concerns are growing on the reliability of the gained information as well as the personal burden during work.

Workers protection during post mortem inspection:

A heavy burden is set on the inspection personnel during meat inspection. With the new technology of separation viscera and carcass and using mirrors for inspection of the opposite carcass surface, the human eye must differently focus without any support. Moreover, monotonous line speed without any variation leads to fatigue.

Reliability:

The efficacy of inspection is more or less unknown: In a survey already done in 1993, the reproducibility of decisions done during poultry meat inspection was 94.7 % (for carcasses fit for consumption) and for condemned carcasses 57.0 % (FRIES & KOBE 1993).

4. Instruments and techniques available

The character of data, collected during slaughter of a herd, is different, and checking the herd at the end of the line (traditional) does not fit the philosophy of the food chain at all. So, information should be gathered from the whole chain, be it results from microbiological or chemical analysis or from other disciplines.

4.1. Data collection during processing with camera aides systems

Under high speed circumstances, automated inspection systems might support work. Since several years, development of equipment without sampling during processing the herd is in progress, based on physical means (different wavelengths: visual, infrared) for various purposes:

- Internal product steering (cutting, whole carcass), payment of farmers and cutting personnel, herd monitoring for shape or weight (FRIES 2007)
- Detection of lesions during meat inspection (VAN HOOFF & ECTORS 2002; STAFFEHL et al. 2007)
- Quality control according to customers demands (PARK & CHEN 2000)
- Screening for visible indicators of fecal contamination, which may reflect a higher risk of Salmonella presence in the unit and which may used as “index- factor” (LAWRENCE et al. 2002; THORNTON 2004)

For such machinery, a standardised and reproducible technique with defined sensitivity and specificity must be available. In a survey on the reliability of camera-based meat inspection “decisions”, STAFFEHL et al. (2007) found on the base of 8,422 condemned carcasses (project in progress) correct results in 92 % of the cases, using the judgement of the inspectors as a standard. In an investigation of WATKINS et al. (1999), the so called “Machine Vision Inspection System” classified 4-5 % of regular carcasses as unfit for consumption.

4.2. HACCP: An instrument for both, collection and correction

From its origin, HACCP is an instrument for detection of aspects of human health concern, it has been developed for safeguarding the manufacturing of space food. Basically, the term “hazard” (and “HACCP”) is limited to human safety (NACMCF 1998). It may be used also for other purposes than human safety. Other factors of concern (general animal health, animal welfare, quality) are also potential targets of general interest, partly combining primary production and the following stages. Only in the abattoir, HACCP based control systems are mandatory.

HACCP at the farm of origin:

In order to get the whole chain under control, HACCP should be considered also for primary production. However, there are major obstacles for a straightforward transfer: Animal stocking (including poultry) makes it frequently impossible to create a particular “point” of critical control and to meet or even prevent a problem in the future.

So, in a farm unit with its sometimes undetermined ways of animals, a straight line character must be constructed, e.g.

- The use of antimicrobial substances as a cause for possible resistant gene sequences, be it in zoonotic agents or in commensals: The therapeutical as such may then serve as a Critical Point.
- In the course of a vertical animal production line with a clean (salmonella free) and a black zone (Salmonella still present), salmonellae are only allowed in those black

zones. Control point here may be the presence or absence of Salmonella in the zone, which had already been being declared “white”.

- The well known interrelation of hook burns or breast blisters and litter humidity may explain the application of HACCP in a smaller scale: Litter humidity in a barn as a causative factor for such lesions may serve as CCP. The other way round, hook burns observed at slaughter (using a camera system) are a CCP for checking the keeping conditions at the respective place of origin.
- The introduction of biosecurity- systems into the farm should serve as a prerequisite

HACCP during service period:

Logistic slaughter: Frequently mentioned these days, LS deems an option to prevent the spread of Salmonella. LS works out only on the assumption, that in the very beginning of the slaughter of the day, the premises are free from zoonotic agents. So, the efficacy of that strategy should be verified (CCP), e.g. by proper cleaning and disinfection and offering an appropriate service time for that purpose. So, proper C&D prior to slaughter of Salmonella negative herds should be a prerequisite for this type of intervention (CCP). For the barns, the resting period (free barns) between two flocks allows the cleaning and disinfection to sink in, thus being a CCP also.

HACCP in the abattoir:

Also here, the line does not provide a CCP in the very sense of the basic definition. In poultry processing, the NACMCF (1997) identified 6 CCP, offering also appropriate testing measures:

- Venting/ opening/ evisceration (correction point is visual contamination)
- Final washing (correction point is content of chlorine)
- Chilling (correction point is temperature)
- Cut-up/ boning/ packaging/ product chilling (correction point is temperature)
- Labelling (correction point is inaccurate labelling)
- Refrigerated storage (correction point is temperature)

4.3. Monitoring, an instrument of data collecting

Monitoring is a repetitive, regular and identical updating of parameters within a procedure, an area or other in order to collect information about the issue in question, also to get information about the emerging or decrease of the risks, which are under observation:

- Microbiological monitoring
- Zoonotic agents in primary production and for contamination in the plant
- Welfare: Provision of data on animal welfare (technopathy, e.g. hook burns)
- Animal health status: (e.g. weight distribution)
- hygiene of processing (visual contamination, evisceration)
- quality aspects (e.g. bruises)

In general, the abattoir is not a bad place for monitoring the birds for items from prior stages. In that sense, mandatory meat inspection during slaughter is a monitoring, too. Lesions observed can serve as an aid to prevent failures in farm management (feed back).

4.4. Good Practices and biosecurity as basic approach to provide hygiene

Finally, there is need for basic precautions in all stages of the line to keep the respective subject of concern safe (“biosecurity” in the holding and “hygiene” in secondary production) in order to keep risks outside, using all options over the whole chain.

The place of origin:

Biosecurity programmes are designed to minimise flock contact or contamination from humans, other flocks, wild birds or other animals, pets, feeds not provided by the contracting company, unsafe water or contaminated equipment (NACMCF 1997).

Good Hygiene Practice: More technical solution is needed to catch up with the continuous flow of agents from birds in the origin to machinery in the abattoir. There exist several keystones of biosecurity at farm level (FRIES 2006), including observation of circuits in the farm, i.e. the black and white concept concerning the area including buildings, management of the area and the animals, traffic and visits, veterinary measures.

The abattoir:

Good Hygiene Practice: Zoonotic agents are either in primary premises prior to stocking or they may enter the chain anytime during the fattening period. Consequently, focussing on the abattoir is too narrow. Options for improving abattoir lines have been reviewed by FRIES (2002).

5. Discussion: How to come to a new approach in practice?

5.1. Correction or reflection

The herds must remain under control during the whole lifespan of the birds (“from stable to table”). Control would be done simultaneously, on a mandatory (“control of control” or direct supervision) as well as based on company measures (internal control).

So, mandatory meat inspection finds itself in a bundle of other monitoring and control systems. It should be stressed, that the final responsibility lies with the food entrepreneur, and traditional meat inspection service should find its role and function in this context, too.

5.2. Defining the aim of the exercise and acting appropriately

In the end, only a multitude of questions and answers may provide a full picture of the herd and its relevant circumstances. We should realise, that the only way of keeping consumer confidence is transparency:

- Health related data from the farm including clinical data of the flock and post mortem data on the occurrence of lesions
- Provide animal welfare evidence
- Provide information on the use of therapeutics
- Detect the local prevalence of zoonotic agents
- The technical line must provide a safe product (Biosecurity at the place of origin, GHP in the abattoir)

Identification of elements is needed, which are capable to reflect the food chain in a reliable way for all matters of concern (human health, animal health and animal welfare). Having identified such elements, appropriate techniques (quick and reliable analytic /observative methods) are required.

6. Summary

Traditional idea of meat inspection was appropriate at the historic period, in which it has been developed. However, today’s shape of surveillance must not necessarily be the same as it was in the 19th century.

By now, meat inspection is changing from an instrument of final approval of the product (“traditional”) to an instrument of supervision and approval of efforts done by the producer.

The aims of poultry meat inspection is transparency with respect to human health, animal health and welfare as well as meat quality. These days, also animal rights is under discussion.

Former Directive 71/118/EEC was the most important legislative base for poultry meat inspection. Meanwhile, legislation has been transformed to a package of Regulations

(concerning hygiene, zoonotic agents, animal welfare, residues, quality), which is continuously under scrutiny and development. The legal basis of surveillance comes from a variety of legal sources, which makes the business not easier.

What remains for post mortem inspection, is sort of corroboration of information about the health status using instruments traditionally applied at that position.

These days, traditional ante and post mortem inspection on poultry is only partly effective, if it comes to the relevant issues of our time. In particular we have to face several challenges:

- Solve the problem of pressure on inspecting personnel by fast running lines (use of inspection machinery). Simultaneously, reflect the efficacy of personal inspection procedures in order to have an idea of the reliability of the procedure.
- Integrate a.m. and p.m. inspection into such a major safety assurance system, adapting HACCP as a useful instrument to the primary production.
- Analyse the meaning of post mortem lesions, using the instrument of Risk Analysis: What should be worthwhile to be detected, either for human or animal health, animal welfare or also perhaps for quality? What counts for poultry, must be found out by evaluating their potential impact on animal and human health and wholesomeness.
- Correction or reflection: Decide on the purpose of meat inspection: Should lesions serve as background information or are they looked for "only" for condemnation reasons? In every case, limits and specific definitions should be in place. Following the new legislation, this question of correction or reflection has been answered already: Reflection.
- Let the poultry chain continue to remain a pilot food animal category by promoting further development, as it was always the case: Identify problems, decide on corrective measures, implement prevention measures and supervise the efficacy of the system
- For further development of the poultry food chain, the authorities should permanently reconsider their (administrative) measures.

The balanced integration of various approaches into a uniform system of chain control is the final challenge for veterinary meat inspection.

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