Veterinary Inspection in Slaughterhouses: Future Challenges

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Summary

The situation : In animal husbandry and processing, technology is ever changing, and consequently hazards or even risks might emerge or disappear. So, the situation must be watched in order to anticipate developments.

The challenge :
A challenge does exist not only for veterinary authorities. Cooperation of all institutions is required:
- To supply enough food on a global base
- To get rid of particular agents by finding and closing ports of entry in the line
- To develop and to apply appropriate “Good Practices”
- To make sure, that the procedure is in good order and to have instruments available to provide such insight.

The authorities are expected
- To develop standards for inspection by initiating an assessment of risks carried by lesions frequently observed
- To integrate increasing numbers of legislative branches: Concerning zoonotic agents, epidemics, performance of ante and post mortem inspection (domain of “traditional” meat inspection)
- To let go some traditional domains of “meat inspection” and to apply the chain philosophy, which is true for the industry, too
- To find a balance between internal and external control (organisation)

Introduction and Background

In animal husbandry and processing with a technology ever changing, ports of entry for any type of agents may change, too. So, the situation must be watched in order to anticipate possible hazards or even risks emerging or disappearing.

This contribution considers future concern in poultry production and consequences to be drawn by the authorities.

The global market or: The world growing together

With global trade of goods as well as of living animals, also with global travelling, zoonotic agents or animal diseases may easily be transferred in a short time's notice. Climate change enables agents to settle at the place where they had been transferred, possibly finding appropriate conditions for (constant or intermediate) colonisation.

In consequence, the risk of newly emerging pathogens is ever present.

The society or: Geography of production and consumption

Each geographic area and society has got its specific food concern: local demands or food safety objectives are different, consequently, objectives of control within (different) food chain (s) are different, too.

Poultry meat is widely accepted without any religious or socio-cultural restrictions, which leads to an ever increase of poultry production and consumption worldwide.

Technical and sanitary issues of the poultry food chain

The poultry food chain or: Benefits of the line

To meet the challenge of pure number, all stages from breeding via husbandry, transport, lairage, slaughter & processing up to cutting and further processing are going to be interconnected. Even transport-technology fits into the slaughter line. Accordingly, in primary production we find large herds supplying such abattoirs.

In consequence, one accident may affect the whole line.

To run an abattoir at high speed (up to 12,000 broilers/ h) requires sophisticated technology. With respect to the species, the lines differ in equipment and automatisation. With more than one shift per day, time for service (hygiene and techniques) becomes shorter.

In low cost countries one will find establishments with a lower grade of mechanisation, in industrialised countries, poultry meat production is characterised by high technological standards.

In primary production, we find different structures, too: Local backyard or free range systems and (international) technology with far developed housing systems, all of them with a different ecology and epidemiology and consequently with a different sanitary status, too.

Interrelation between the stages or: Risks and benefits of the line

Spoilage microorganisms: The stable´s microflora would be transferred into the abattoir and further on via the birds (outside and the gut's microflora). The living bird is the main and primary source of bacteriological pressure into the abattoir, in the course of technology only gradually changing (FRIES 2005): We find an specific bacteriological profile of poultry meat processing, for which the skin is a good sampling material.

Salmonella and Campylobacter: This is true also for zoonotic agents. One way of pathogen bacteria into the human habitat leads from the farm via food of animal origin. So the contamination stage of one-day-chickens as well as farm environment is of paramount importance for transmission into the abattoirs and further on.

Impact on macroscopic appearance post mortem: Husbandry, transport, lairage, slaughter, further processing (including cooling) contribute to the better or worse status of the end product.

From the farm of origin: There is a strong relation between litter condition and the amount of ammonia in the litter and the atmosphere within the stables. Ammonia predisposes for respiratory diseases, inclination to infections, depression in growth rate and alterations of the skin (pododermatitis, breast blisters). Besides, it is one of the greenhouse gases.

From transport: The term "transport" covers loading for transport, transport on the lorry, unloading, lairage as well as shackling. Especially during handling the animals by personnel (catching and shackling), bruises and bone breakages often occur, resulting in downdgrading or condemnation of the whole carcass.

From slaughter: Improper stunning (high voltage, too long an interval between stunning and sticking) may lead to increased occurrence of haemorrhages in the muscle by rupture of blood vessels (pigs, cattle, poultry). Bone breakages also occur. Damage of this kind leads to downgrading.

Prevention versus curing: Preventive veterinary medicine, the tem of health

In case of need, curing is necessary out of animal welfare reasons. However, food animals should remain healthy during their lifetime: In particular, in a poultry flock animal diseases are a major accident, zoonoses should not occur, animals should not be carrying any agent or substance being harmful to humans (i.e., therapeuticals, zoonotic agents or resistance genes).

So, for a food animal herd, health may have a different background compared to (individual) companion animals

Veterinary inspection

Legislation and legislative networks

Traditionally, veterinary authorities focused on the abattoir (ante and post mortem inspection), with an increasing insight into the farm (residues, resistance, zoonotic agents, diseases or animal welfare). Simultaneously, the authorities carry out the hygiene supervision in the abattoir.

In the 70ies, in the Member States of the former European Economic Community, meat inspection was made mandatory in poultry meat production, too, partly adapted to the special circumstances of poultry meat production.

In recent years, EU changed its legislation philosophy. With the "food chain", the whole line approach was established on the terms of Risk Based Meat Inspection. Simultaneously, deregulation took place. Regulations come into force immediately in each MS.

These days, Officers must consider a bundle of legislative network: A special Regulation (EC) 854/2004 is concerned only with what we call meat inspection, the "Hygiene Package" of the EU concerns with the whole food chain. Regulations exist for residues, zoonotic agents, rendering, as well as criteria for some sensitive food commodities. Animal welfare rules are to be expected, presently primarily concerning laying hen's welfare or the question of pododermatitis.

Fit or unfit for consumption or: The interpretation of lesions

Lesions: All animals undergo an ante and post mortem inspection. Even in herds being basically healthy, lesions do occur. Some of them would frequently be observed in poultry meat processing (here: broilers) by visual inspection, i.e.:

Ascites:	enlargement of the body cavity
Small animals:	fattening broilers of weigh below 600 to 700g alive
Abnormal shape:	in particular the legs or the sternum
Scabby skin:	brown-coloured honey-comb like eczema with > 3 cm diameter
Deep dermatitis:	diffuse enlargement of the skin yellow-brownish, partly glossy
Incomplete exsanguination:	the carcass deep-dark reddish or blue-reddish in total
Septicaemia:	cannot be separated from incomplete exsanguinations
Ruptures:	lesion of the skin and the muscles
Fractures:	bones visible
Lesion qualitatively:	the character of a lesion without quantitative specification
Lesion quantitatively:	the extension of the lesion as well as the intensity of the observation and its localisation
Bursitis sternalis:	enlargement of the skin, subcutaneous with discolorations up to hemorrhages

However, biological material differs in many ways. The nature of a lesion (infectious or injured from technical impacts), quality, extension and intensity, as well as the site of the lesion on or in the carcass contribute to it's assessment during inspection.

Moreover, the particular lesion must be considered against the whole herd: The percentage of this or that lesion in a herd must be taken into consideration. So, the lowest acceptable weight of a carcass depends on the age of the herd (with increasing age, the weight increases) as well as the distribution of the weight within the herd (which should follow the Gauss distribution curve).

In post-mortem inspection, the decision on fitness or unfitness is not entirely free of personal influence. In consequence, precise criteria are lacking, but they are needed..

The significance of lesions

Once a lesion came to notice, little is available on the background and significance of such a notion in meat inspection. An assessment of lesions with respect to the level of hazards/ risks to humans, animals or the environment is needed. The appropriate method is the instrument of Risk Analysis, for microbiological issues as well as for macroscopic lesions.

In poultry meat inspection, lesions can be attributed to different basic issues:
animal welfare parameters in the holding (food pad dermatitis, litter burns, outcome of beak trimming) or in transport
general animal health: coefficient of variance of weights indicating a different growth speed in the herd
pathological anatomical lesions indicating a disease or technopathy
visual contamination or evisceration efficacy reflecting the hygiene of processing
bruises, ruptures, bone breakings indicating failures in the technical procedure (quality aspects)

Concluding, after detection of a lesion, post mortem meat inspection may serve in the sense of elimination as well as of monitoring the observations during inspection.

The personal factor in meat inspection

Several reports on visual inspection indicate, that a complete elimination of lesions from the processing line is not possible. This relates to different line speeds as well as to the assessment of the same lesion by different persons (FRIES et al. 1992; FRIES & KOBE 1993). So, it may come to either false-positive (fit for consumption but condemned) as well as false-negative (to be condemned but fit for consumption) results of inspection.

The personal factor is an issue in general, so in ante and post mortem inspection, too. With enhanced line speed in poultry processing, the limitations of visual inspection done by human beings become obvious, for some issues, meat inspection fails completely (residues, zoonotic agents).
During ante mortem inspection, individual interpretation takes place, in post mortem inspection, fatigue, personal judgement in case of fit or unfit for consumption are a major issue.
Sometimes, in different regions seizure is different. Standardization is needed.

Post mortem inspection is certainly tiring because of the high speed of the line. This prompts the search for auxiliary systems. Traditional support of inspectors consists of mirrors placed on the other side of the line, line dividers or the implementation of company staff (which in itself bears the same problem as the inspector's dilemma of visual limitation).

Issues of these days

Control, analytical and intervention strategies (Risk management)

Recent legislation on Salmonella and other zoonotic agents (e.g. the EU "zero- solution" for poultry meat) calls for coordination of traditional procedures and new strategies for overcoming the risks of zoonotic agents. Three columns of such systems are to be identified:

The technology: Provision of safety in poultry meat production

Risks must have been analysed with respect to zoonotic agents, resistance, residues or also the aspect of animal diseases or animal welfare. After that, the line must go along the anticipated order.
For this, techniques and internal control measures are needed. "Best Practices" may ensure that the procedure is in good order.

Prudent Use for therapeuticals in primary production

Good Agricultural Practice for legal application of agrochemicals

Biosecurity measures in primary production as a defense against zoonotic agents

Good Hygiene Practice in secondary production for keeping the sanitary status of the procedures as high as possible

Information techniques and systems available for verification

Having organised the line, methods are needed for verification. Techniques of different complexity must be provided:

pre lab (data gathering)

in lab (the use of technical analytical instruments)

post lab (interpretation of results) and setting of limits

Methods come from different disciplines, (e.g.) from physics, chemistry or microbiology

Measurement of technical issues such as temperature or time schedules

Laboratory methods, i.e. microbiological techniques or techniques for residue testing, also methods for clinical lab parameters such as acute phase proteins or other

Observation sheets for personal behaviour, but also for visitations of facilities or for recording of technical data during the procedure

Ante mortem macroscopic inspection based on clinical observation or the inspection post mortem

Availability and accuracy of a method: It should be noted, too, that for all requirements appropriate techniques must be available. Single techniques must provide (a) a correct result and (b) the required information..

Automatisation: In fact, it is necessary to monitor the lesions depending on the particular holding, which is only possible with the use of systems, which also help to keep the costs under control. Automatisation is meant to support the work of personnel. Camera- aided systems are available.

Quality control: Here, camera systems as a part of the internal logistic system.

Veterinary post mortem inspection: In few cases an assessment (falsely or correctly identified carcasses) of the accuracy of this instrument has already been done (PARK & CHEN 2000; STAFFEHL et al. 2007; van HOOF & ECTORS 2002).

Detection of fecal contamination: Also, the detection of contamination is under discussion (LAWRENCE et al. 2002), based on different technology.

Complex systems: Single techniques provide a specific information. They are to be combined into complex systems, e.g. HACCP (in secondary production or discussed for primary production, too) or Monitoring systems, which are for recording of data in a broader area.

In recent years, more information has been made available, making also the transfer of agents transparent: Data of different sort (resistance, zoonotic agents, outbreaks or prevalence of epidemics) are periodically collected by official bodies, such as the EU- Zoonoses- Report or the RASFF- programme of EU or data from the OIE.

Intervention: Corrective measures in case of need

Having found a gap in the system, intervention is needed. Besides immediate repair or closing the port of entry, meat inspection is a mixture of information gathering and intervention. The same is true for HACCP.

Meat inspection (ante and post mortem):

Several options of compensating for the high speed lines do exist:

Prevention of diseases in the herd in order to control the upcoming of lesions

Biosecurity to keep zoonotic agents under control

Good Husbandry Practice to prevent technopathy caused by technical failures in the holding

Improvement of poultry meat processing technology in order to prevent failures which may lead to increase of elimination work during processing

Development within the field of inspection systems itself (e.g. computer aided camera systems)

HACCP in the Farm of Origin: HACCP is discussed for use in primary production, too. However, it must be redefined and adapted to the circumstances. Presently, some major obstacles are

Stocking habits of a mixture of animal species in one production unit.

Lack of a straight design of animal (stocking) rearing, weaning, fattening (with the exception of poultry production)

Multicausal prevalence of zoonotic agents, resulting in difficulties to allocate the “failure”.

Summary or: The challenge

Challenge does exist not only for the authorities. Between all participants of poultry meat production, basic agreement on terms which should be watched, is needed:

inspection and intervention systems adopted to the current risks

instruments for that purpose

The Legislative Issue

Legislation reflects the objectives as well as expectations of the local society. Having identified the issues to be looked for, having also decided on the appropriate methodology of control, the legislative issue comes up. However, this is a political issue and not a veterinary one.

Challenge for the technical line

To supply enough food on a global base

To get rid of particular agents by finding and closing ports of entry in the line for predominant agents, which is true at present in particular for Salmonella and Campylobacter

To develop and to apply appropriate “Good Practices” including biosecurity measures, even elements of HACCP in primary production

To keep and further “hygiene measures” in secondary production

The challenge for the authorities: To re-define the role of authorities

The end product check (presently performed as mandatory ante and post mortem inspection at the abattoir) has its worth, however, with verification, one should start with information from primary production.

In particular, the authorities are expected

To develop standards for inspection by initiating an assessment of risks carried by lesions frequently observed

To integrate increasing numbers of legislative branches (concerning zoonotic agents, epidemics, morphological meat inspection, ante and post mortem issues)

To let go traditional domains of “meat inspection” and to apply the chain philosophy, which is true for the industry, too

To find a balance between internal and external control (organisation): appointment of particular tasks to institutions

To apply techniques with appropriate information value providing the wanted insight.

To enhance the sensitivity and specificity of personal work

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