

# ADVANCING THE HYGIENE MANAGEMENT SYSTEM AT POULTRY ABATTOIRS IN GAUTENG, SOUTH AFRICA

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## Abstract

The Meat Safety Act, Act 40 of 2000 compels all registered abattoirs in South Africa to implement and maintain a Hygiene Management System (HMS) to ensure the safe processing of meat. The HMS is a basic food safety system that focuses on process standards that are designed to reduce the risk of contamination of meat and meat products during processing. Part of the Poultry regulations provide the requirements of HMS and were published by government on the 24th of February 2006. However, no guidelines were published or made available to poultry abattoir operators on how to interpret and implement the requirements of the HMS.

The aim of this research was to determine the extent of HMS implementation at poultry abattoirs in Gauteng. The intention was to identify shortcomings, if any, within implemented HMSs with the intention of promoting compliance. This was achieved by developing common themes from research audit findings. These themes were then used to suggest critical areas that should be addressed during the development of an HMS implementation guideline document.

**Keywords:** Hygiene Assessment System, Hygiene Management System, HACCP, poultry abattoir, meat safety

## 1. INTRODUCTION

Food-borne disease outbreaks and related deaths in the United States of America (USA), the United Kingdom (Hutter and Amodu, 2008) and Australia (Khatri and Collins, 2007) have compelled regulatory authorities to improve food safety control measures.

Holt and Henson, (2000), demonstrated a strong correlation between meat consumption and food-borne disease outbreaks. Contamination of meat during processing at poultry abattoirs occurs either through personnel (during manual defeathering and/or evisceration), equipment (such as knives used during evisceration) and/or carcass contact with water from the scalding process used to facilitate defeathering. Such food safety risks have necessitated the regulation of risk-based food safety systems e.g. the Hazard Analysis Critical Control Point (HACCP), in the meat industry (Mead, 1994 and Vandendriessche, 2008).

The HACCP system was initially developed in the USA in the 1960s. In the 1970s it was used in the USA canning industry and in the 1980s used beyond USA borders (Panisello & Quantick, 2001). It was later adopted by the World Health Organisation (WHO) as an international standard in 1993 and later revised in 2003 by Codex Alimentarius Commission (CAC, 2003). The HACCP system was, and still is, widely used as a food safety management strategy that is regarded as an effective means of preventing food-borne diseases (Ehiri et al, 1997). Standards South has adopted the HACCP standard for local usage through the publication of the SANS 10330: 2007 standard. However, HACCP is presently a voluntary standard and is generally applied to exporting plants or to plants supplying more lucrative up-markets where customers require HACCP certification. This also applies generally to abattoirs in South African.

With the privatization of abattoirs and the meat inspection function in the late 1980's, government no longer had direct control over the processing of meat at abattoirs. Abattoirs were then, and presently are, managed by private operators. In an attempt to improve control over safe meat handling and processing at abattoirs, the Department of Agriculture, Forestry and Fisheries (DAFF) enacted the Meat Safety Act, Act No. 40 of 2000 (SA, 2000). Poultry regulations R 153 of 2006 (SA, 2006) published by the DAFF under the Meat Safety Act, Act No. 40 of 2000 (SA, 2000) set out requirements for the implementation of a basic meat safety management system called the Hygiene Management System (HMS).

The HMS was based on the principles of HACCP and its requirements were developed by the United Kingdom (UK). After the democratic elections in South Africa in 1994, free trade was opened to the rest of the world. In order to facilitate meat trade with the UK, South African export abattoirs had to implement a HMS. Export abattoirs later pursued HACCP systems that required certification, due to consumer pressure. However there was no compulsory system required to manage operational processes to ensure meat safety for non-export abattoirs, supplying the local market. The DAFF later regulated some of the requirements of the HMS, initially used by export abattoirs, for national implementation applicable to all registered poultry abattoirs in 2006. This was done in order to improve safe meat handling and processing practices at poultry abattoirs. The DAFF also implemented the Hygiene Assessment System (HAS) to assess the hygiene status of abattoirs. Veterinary officials audit abattoirs using HAS, which includes an audit of the HMS. One of the aims of the HAS is to verify if the HMS has been correctly implemented and utilised at abattoirs.

## **2. PROBLEM STATEMENT**

The enforcement of the Meat Safety Act, Act No. 40 of 2000 (SA, 2000) in the poultry abattoir industry functions on the basis that industry, has the responsibility to know and interpret the Act and standing regulations under the Act.

This implies that the industry has also to be familiar with the HMS, its requirements and any additional requirements for safe meat handling and processing not included in the HMS e.g. waste management practices. There are, however, no guidelines available to assist poultry abattoir operators regarding the interpretation of the requirements of the HMS and how these requirements may be implemented correctly. It is up to the owners of abattoirs to collate and interpret the information from these lengthy legal documents and implement the requirements at abattoirs. Abattoir owners may therefore experience challenges in the interpretation of meat safety legislation due to the varying degrees of expertise available at the various poultry abattoirs. Given these challenges, in addition to limited research done in this field to gauge the level of HMS implementation at abattoirs, this study was undertaken.

### **3. RESEARCH AIM AND OBJECTIVES**

The purpose of this research was to determine the level of HMS implementation at abattoirs, with the aim of identifying any implementation short comings of the HMS. This information was then used to suggest themes to inform guidelines that may be used to advance the HMS implementation at poultry abattoirs.

The objectives of the study were (1) to assess the hygiene status and level of HMS implementation in different grades of poultry abattoirs, using the HAS; (2) to identify HMS implementation gaps from this assessment; and (3) to use this information to propose themes towards the development of guidelines that clarifies and simplifies the implementation of HMS at poultry abattoirs.

### **4. METHODOLOGY**

This study adopted the qualitative case study type of research using the same methodology previously used by Govender and Genis (2010).

#### **4.1 The study population and sample**

This study was conducted at poultry abattoirs in the Gauteng Province of South Africa. Poultry abattoirs are categorized into high and low throughput, depending on the number of birds slaughtered per day. High throughput abattoirs have the capacity to slaughter more than 2000 birds per day while low throughput abattoirs can only slaughter up to 2000 birds per day. Five high throughput abattoirs and five low throughput abattoirs were randomly selected for this research. Given that processes in poultry abattoirs are fairly generic, and to avoid information saturation (Seidman, 1998) a sample size of ten abattoirs out of a total of 33 registered poultry abattoirs in the province, was considered sufficient for this research.

Because the operational processes within abattoirs are fairly generic, and each abattoir in the sample was studied in depth, it was considered that the information gained from this sample size would be sufficient to make inferences regarding the situation in the general population (McMillan & Schumacher, 2001).

## **4.2 Data collection**

The HAS audit checklist is used as a national instrument to audit abattoirs for meat safety, and includes auditing of the HMS requirements. The HAS was used to audit the poultry abattoirs to obtain the required qualitative data. In addition, the requirements of the HMS were also audited directly from the Poultry Regulations R 153 of 2006 (SA, 2006).

The HAS contains eleven weighted categories namely ante-mortem inspection; slaughter and processing; meat inspection; chilling, portioning and packaging; cold storage and dispatch; offal processing; sanitation and pest control; personnel; structural requirements and maintenance and Hygiene Management System. Further, each audited aspect has a scale ranging from "fair" to "excellent". All HAS audit categories were audited during the research process. These audited aspects were scored but more importantly implementation short comings were recorded. Audits were conducted over a four month period.

## **4.3 Data analysis**

Non-conforming abattoirs were identified as those abattoirs that scored at a "fair" rating and below per audit sub-category. Thereafter the number of nonconforming abattoirs per sub-category was enumerated and then converted to a percentage for further analysis. Further analysis considered those sub-categories that yielded a 40% non-compliance rate and above.

A cut-off point was necessary to identify those areas that probably require greater explanation of the HMS based on research audit findings. A 40% non-compliance cut-off point was used, considering that it would include non-conformances due to lack of understanding, or resources, or even indifference (Govender and Genis, 2010). It was reasoned that 50% would not be a useful cut-off point, since 50% non-compliance could mean partial understanding, or complete understanding but indifference. However, 60% compliance probably suggests that most persons understand the issue, but not necessarily all the ramifications, and can therefore implement that aspect, but perhaps not fully.

The assessment framework was then formulated as follows:

- Any criterion that indicated non-compliance across abattoirs of 40% and more. The reasoning was that if non-compliance was as high as 40%, then whatever the underlying reason, it would be useful to clarify and emphasize this aspect of the framework; and
- Any criterion that indicated a non-compliance rate of less than 40%, but which was critical to ensure public health, e.g. meat inspection.

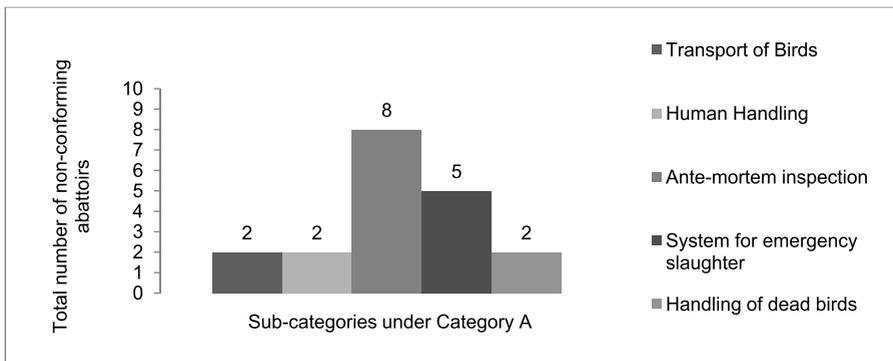
The results of research audit findings are presented in the next section.

## 5. RESULTS AND DISCUSSION

The weighting assigned to each HAS category and criteria audited is based on the inherent risk to meat safety posed by abattoir practices. The weighting allocation within the eleven HAS categories include, A) ante-mortem inspection (0.05); B) slaughter and processing (0.15); C) meat inspection and marking (0.12); D) chilling, portioning and dispatch (0.10); E) cold storage and dispatch (0.10); F) offal processing (0.03); G) sanitation and pest control (0.10); H) personnel (0.07); I) general conditions (0.08); J) structures and maintenance (0.10) and K) Hygiene Management System (0.10).

Categories of greater importance (weighted 0.1 and above) are those which have a direct impact on the safe processing of meat at poultry abattoirs. Those categories that have an indirect impact on meat safety (weighted <0.1), although still important to consider within the HMS, have a direct impact on the safe processing of meat at abattoirs.

The results presented in this section provide the total number of nonconforming abattoirs per audit category. This number will be discussed as percentage non-conformance. The results of audits within category A (Ante-mortem) are represented graphically in Figure 1.

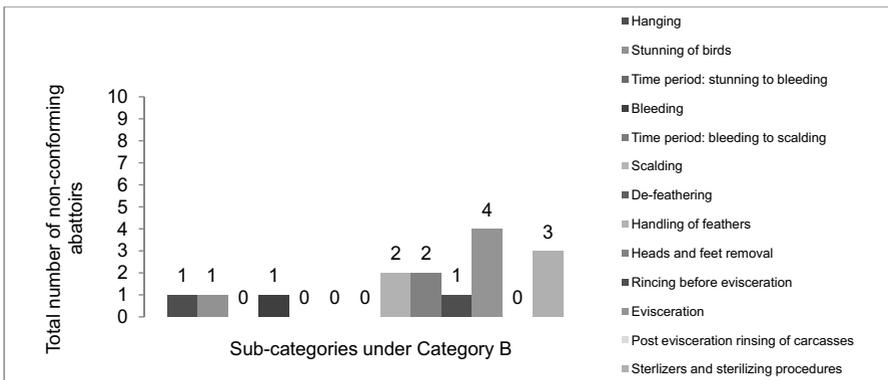


**Figure 1:** Non-conforming poultry abattoirs as per Category A: Ante-mortem

Category A, is an important step in meat safety control because diseased stock can be identified before slaughter. This reduces the risk of cross contamination between diseased meat and meat that is likely to become contaminated during processing with healthy meat.

There was generally adequate compliance within this category. However, at least 80% of the abattoirs did not conduct ante-mortem inspection. This was likely due to meat inspectors not being available to do the inspection, or they were conducting primary meat inspection duties on the processing line. It was noted that training records of staff receiving birds could not be verified at some abattoirs. In addition, in at least 50% of the abattoirs, it was observed that standard operating procedures regarding the handling and processing of injured birds as well as ante-mortem inspections were either lacking or not implemented at, particularly low throughput, abattoirs. These abattoirs did not have any documented system in place to deal with emergency slaughter of birds. This presents a risk to animal welfare.

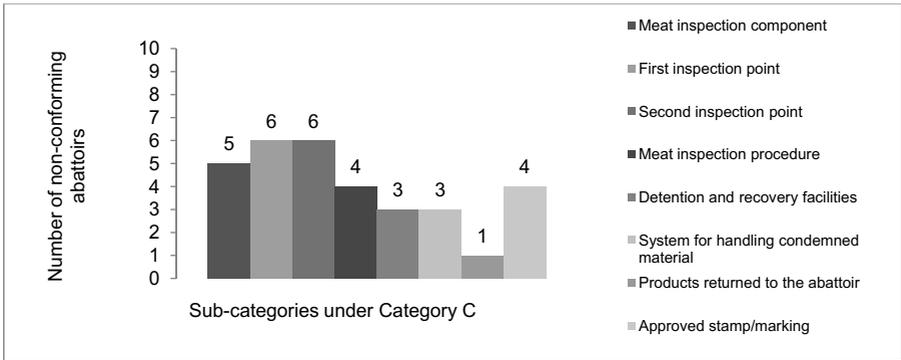
The results of audits within category B (Slaughtering and processing) are represented graphically in Figure 2.



**Figure 2:** Non-conforming abattoirs as per Category B: Slaughtering and processing

Abattoirs in the sample were found to be generally compliant within this category. It was however observed that gut contamination of carcasses was higher at lower throughput abattoirs (40% of the sample) particularly where evisceration was done manually. It was also observed at these abattoirs that faecal contamination was washed off and not trimmed by the inspector. This practice may increase the microbial load of carcasses to unacceptable levels.

The audit results for Category C are represented graphically in Figure 3 below.

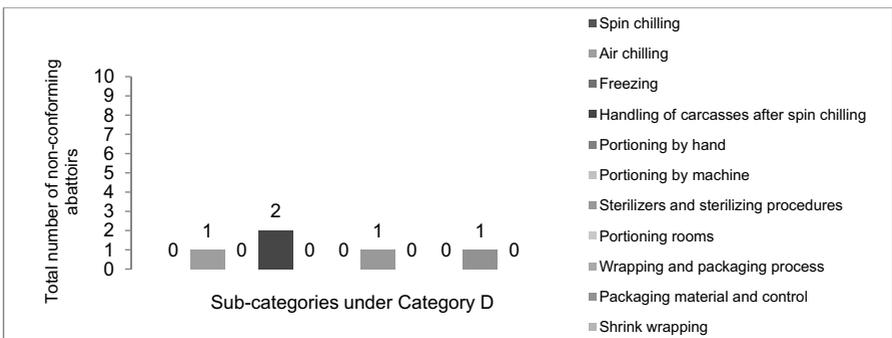


**Figure 3:** Non-conforming abattoirs as per Category C: Meat inspection and marking

It was observed that in at least 50% of the sample, that inspectors were not registered with the Gauteng Veterinary Services. Therefore the credibility of the expertise of the inspectors was unknown at the time of these audits. It was also observed that in 60% of the sample, continuous meat inspection was not done adequately at first and second inspection points. This was either because no inspector was available on the line or was attending to other duties in the abattoir.

While abattoirs complied with meat inspection marking, it was observed that most abattoirs print their own “passed stickers” and control of the stickers could not be demonstrated at 40% of the sampled abattoirs. This is required in order to demonstrate that meat is safe for human consumption.

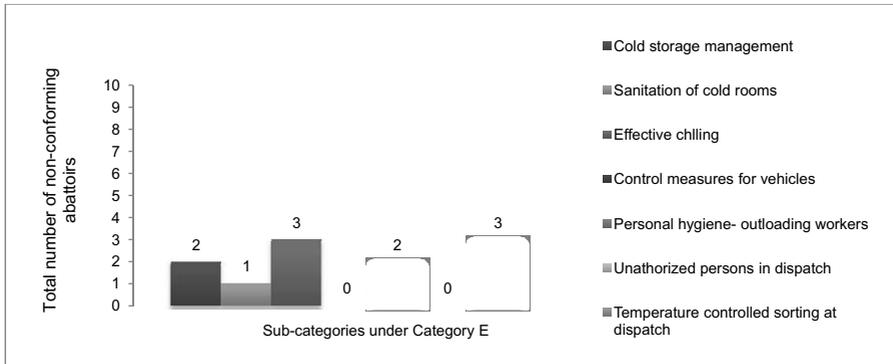
The audit results for category D (Chilling, portioning and packaging) are represented graphically in Figure 4 below.



**Figure 4:** Non-conforming abattoirs as per Category D: Chilling, portioning and packaging

Abattoirs in the sample were found to be generally compliant within this category. In at least two abattoirs, 20% of the sample, it was observed that dropped carcasses were merely rinsed and placed back on the line without re-inspection by the inspector. No procedures for dropped carcasses were available at these facilities. This practice presents a meat safety risk due to the contamination of meat without remedial intervention through re-inspection as required by the HMS.

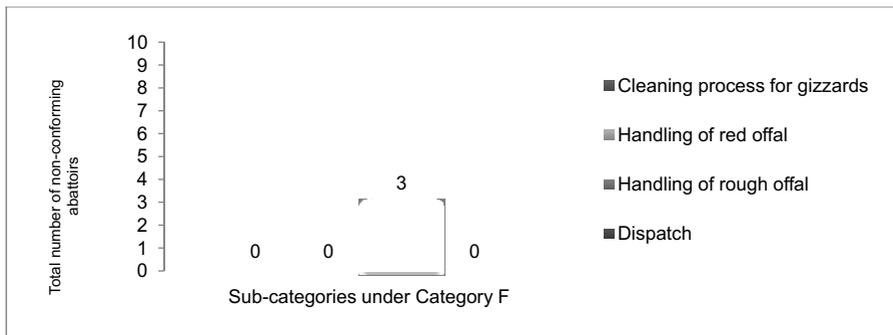
The audit results for category E (Cold storage and dispatch) is represented graphically in Figure 5 below.



**Figure 5:** Non-conforming abattoirs as per Category E: Cold storage and dispatch

Abattoirs in the sample were found to be generally compliant within this category. It was observed that 30% of the abattoirs did not calibrate thermographs of chillers. In addition, 30% of the abattoirs did not maintain the temperature at the dispatch area at the required 12°C or below.

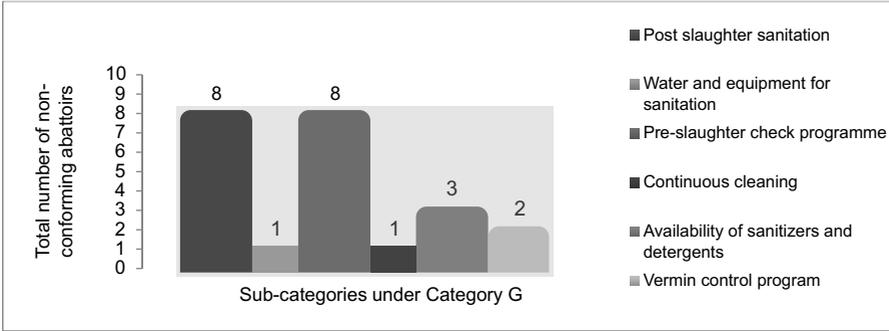
The audit results for category F (Offal processing) are represented graphically in Figure 6 below.



**Figure 6:** Non-conforming abattoirs as per Category F: Offal processing

Abattoirs in the sample were found to be generally compliant within this category. During the study however, 30% of the sampled abattoirs were found to be mixing edible and inedible offal together in chillers.

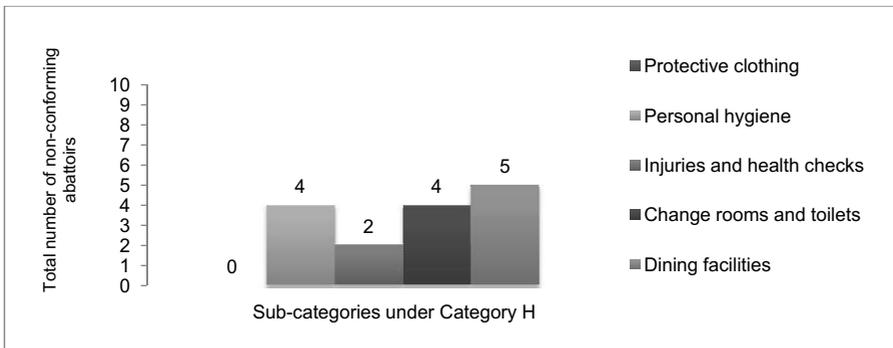
The audit results for category G (Sanitation and pest control) are represented graphically in Figure 7 below.



**Figure 7:** Non-conforming abattoirs as per Category G: Sanitation and pest control

At least 80% of sampled abattoirs did not conduct pre and post slaughter checks of cleanliness of chillers as no records to this effect were available. In addition, 30% of abattoirs did not conduct continuous cleaning of the production area while 20% did not have an adequate pest control programme in place.

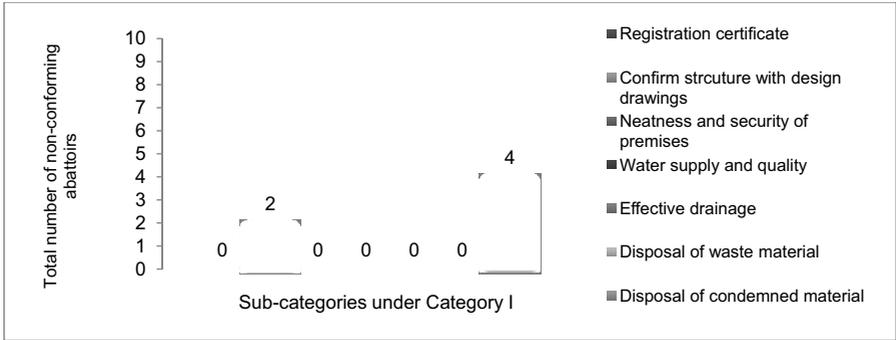
The audit results for category H (Personnel) is represented graphically in Figure 8 below.



**Figure 8:** Non-conforming abattoirs as per Category H: Personnel

During the study it was observed that 40% of, particularly low throughput, abattoirs did not have a code of hygiene conduct in place. There was also no staff training records available relating to personnel hygiene training. These abattoirs also did not conduct daily fitness checks on staff to determine if they were fit to handle meat. It was observed that 50% of the abattoirs did not provide dining facilities for employees resulting in employees using clothing lockers to store food, which presents a risk to employee safety through cross contaminating their own food.

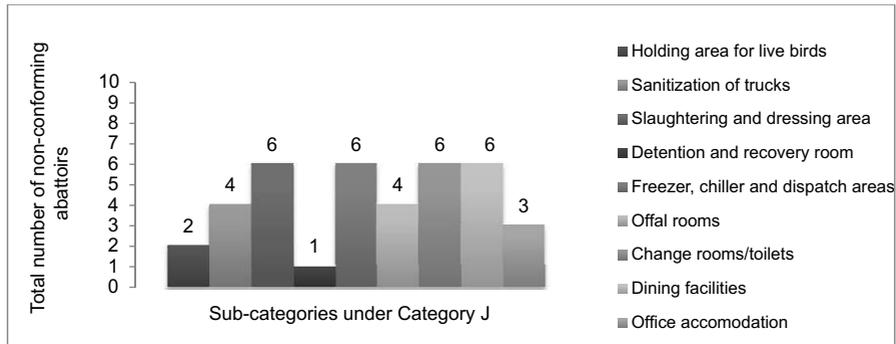
The audit results for category I (General conditions) are represented graphically in Figure 9 below.



**Figure 9:** Non-conforming abattoirs as per Category I: General conditions

Abattoirs sampled were found to be generally compliant within this category. However 40% of the abattoirs did not have disposal plans in place to deal with condemned material.

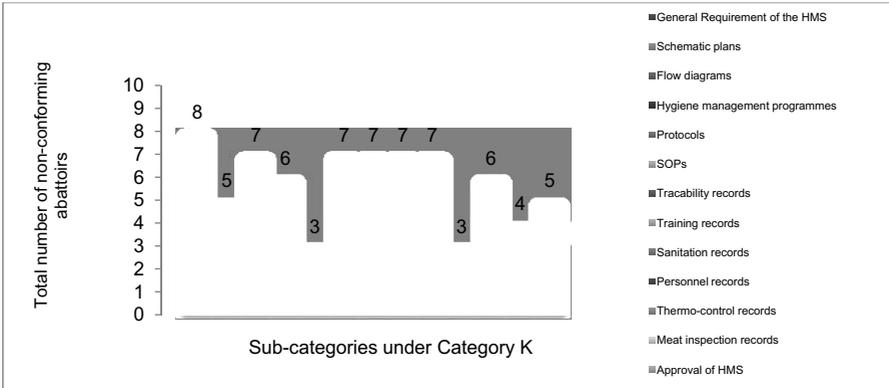
The audit results for category J (Structure and maintenance) are represented graphically in Figure 10 below.



**Figure 10:** Non-conforming abattoirs as per Category J: Structure and maintenance

At least 60% of, particularly low throughput, poultry abattoirs required maintenance in the slaughter and dressing area, chillers, change room facilities for workers and dining facilities for workers. A comprehensive maintenance plan for the whole plant at these abattoirs was not documented. At least 40% of abattoirs did not have adequate truck wash facilities. It was observed that in 30% of abattoirs, meat inspection personnel did not have adequate office accommodation facilities.

The audit results for category K (Hygiene Management System) are represented graphically in Figure 11 below.



**Figure 11:** Non-conforming abattoirs as per Category K: Hygiene Management System

As a general observation at all audited abattoirs, procedures required by the HMS were not documented and if they were documented, they were either too generic or were not followed.

With reference to the HMS requirements, it was observed that in at least 80% of the abattoirs sampled, documented procedures were available but were not followed in practice. A risk assessment contemplated in Regulation 51 of the Poultry regulations R 153 of 2006 (SA, 2006) was not conducted at these abattoirs. This assessment forms the basis upon which procedures within the HMS are developed. Managers developing the HMS at facilities audited indicated that they required more information on what was expected of them to be compliant with this HMS requirement. These abattoirs also did not conduct internal audits using the HAS. Many abattoirs did not keep corrective action records.

Abattoirs did adequately have protocols and traceability records. However 60% of abattoirs did not have the required HMPs, 70% did not have the required SOPs, 70% did not have training records available, 70% did not keep sanitation records, 60% did not monitor chilling temperatures and

thermographs were not calibrated and 70% of abattoirs did not conduct mock recalls as part of traceability system. Also these abattoirs used “passed stickers” that did not have unique numbers on them to allow for trace back of carcasses to a specific supplier of birds. It was observed that 40% of abattoirs did not perform competency checks on meat inspectors and 50% of abattoirs still required approval of their HMSs by the Principle Executive Officer from Veterinary Services.

The HMS documentation audited at abattoirs was available at different places in the abattoirs and not collated in one place. This however is not a requirement of the regulations. The disparity between documented procedures and implementation in practice at these abattoirs combined with the observation of difficulty in locating HMS documentation is perhaps indicative that the HMS has not been internalized by management.

## **6. COMMON THEMES EMERGING FROM RESEARCH AUDITS**

Twelve themes emerge from the analysis of the results presented above and include (1) risk assessments, (2) meat safety manual and related documentation, (3) training and skills maintenance, (4) record keeping, (5) meat inspection, (6) product recalls, (7) maintenance, (8) internal audits, (9) cleaning and sanitation; (10) pest control, (11) disposal of condemned material and (12) corrective action and continual improvement of the management system. A more elaborative discussion is provided on these themes below.

### **6.1 Risk assessments**

Risk assessments were not done at most of the abattoirs. Many low throughput abattoirs indicated that they did not know how to go about complying with this requirement. Without meaningful risk assessments, adequate control measures cannot be established as part of a preventive approach to safe meat processing within the HMS. Further, there are no guidelines available for abattoir owners to consider in order for them to conduct meaningful risk assessments. This remains a critical gap towards the advancement of the HMS implementation at poultry abattoirs.

### **6.2 Pragmatic SOPs**

It was a general observation that SOPs contained inadequate information about the responsible person/s, purpose, scope and actual process steps. Many abattoirs that had procedures in place did not reflect compliance to SOPS during operational practice. Combined with inadequate risk assessment, inherent risks to processes may not be adequately addressed within present SOPs.

Guidelines may address these issues through the provision of templates in order facilitate practical procedures that work effectively towards mitigating or eliminating meat safety risks during processing.

### **6.3 Training and skills maintenance**

The importance of training food handlers has been demonstrated by authors like Tebbutt (1992) and Clayton et al. (2002). Red meat abattoirs have access to, and may use, the services of the Red Meat Abattoir Association (RMAA) to provide training on all aspects of abattoir processing save meat inspection. However it was observed that a similar training body is currently not available to poultry abattoir operators.

It was however observed that operators from both high and low throughput abattoirs conduct internal training related to all aspects of abattoirs processing such as slaughter techniques, personal hygiene and cleaning and sanitation but not on meat inspection. Some high throughput abattoirs have contracted private service providers to conduct training on cleaning and sanitation. Low throughput abattoirs however found it difficult to comply with this requirement due to limited resources. Some low throughput operators designed their own training programmes. However, the effectiveness of such training is questionable and will need to be evaluated. Training of personnel at poultry abattoirs therefore remains a challenge.

### **6.4 Record keeping**

Records were generally not available particularly at low throughout abattoirs. Records that were available indicated that monitoring was inconsistently carried out, if it was done at all. Record keeping particularly pertaining to process monitoring is critical for abattoir operators to demonstrate control of processes in the absence of government officials. It also demonstrates what corrective and preventative actions were taken to address deviations observed during process monitoring.

### **6.5 Meat inspection**

Continuous meat inspection was not observed in some of the abattoirs despite the high weighting of this category in the HAS of 0.15 to the final HAS score. In the past no meat inspection was required for carcasses and offal at poultry abattoirs. However government, in 2006, instituted a new policy that requires meat inspection at poultry abattoirs. Guidelines regarding how competency assessment of meat inspectors/examiners should be carried, by who, when and so on may greatly facilitate compliance to this requirement. In addition, control over “passed stickers” seemed to require more control by inspectors to prevent unauthorized usage of these stickers.

## **6.6 Product recalls**

Mock recalls were not done as required. These criteria need to be monitored more closely by government authorities in order to facilitate compliance. The efficiency and effectiveness of product recall is even more critical in environments where microbiological testing does not inform the release of the final product, but is done afterwards for only for verification. Recall systems need to be well documented, simulated and constantly improved to ensure public safety in the event that recall is necessary.

## **6.7 Maintenance**

Most of the abattoirs audited did not have maintenance plans in place. A well maintained facility ensures employee health and safety, public health by ensuring the safety of meat through hygienic processing as well as facilitating good animal welfare practices. It was noted during the study that most of the smaller facilities lacked adequate maintenance and a maintenance plan is therefore of vital importance.

## **6.8 Internal audits**

Many abattoirs sampled did not conduct regular internal audits to verify the effectiveness of the HMS. A great disadvantage of not conducting internal audits is that non-conformances may not be identified and correction adequately made. Instead, these abattoirs rely on government audits every quarter to identify non-conformances. In other provinces these government audits are even less frequent due to various reasons that include shortage of personnel. A drawback of such an approach is that problems are dealt with from a reactive standpoint which allows little room for improvement within the HMS. Consequently, no corrective action plans, follow-up and reporting takes place except during government audits. Government should be stricter regarding compliance to internal audits. In addition, abattoir owners should utilise meat inspectors to carry out these internal audits.

## **6.9 Cleaning and sanitation**

Some abattoirs did not have cleaning programmes in place and some facilities, particularly the low throughput abattoirs, were observed to be dirty during pre-operational inspection of chillers, production areas and meat contact surfaces. A structured and systematic approach towards cleaning and sanitation may be facilitated by cleaning schedules that specify responsibility, frequency and standard to measure cleanliness. A guideline document may facilitate effective pre, post and operational cleaning and sanitation through the provision of template schedules and records.

## **6.10 Internally managed pest control programmes**

Pest control is a critical foundational programme required in the food industry and should be managed effectively. Some abattoirs, particularly at low throughput, were organising and managing their own internal pest control programmes. Owners purchase their own vermin poisons and insect control equipment. However, adequate management of pest control could not be demonstrated during this research through records. Guidelines on objectives of adequate pest control management would advance compliance considering that the regulations do not specify these objectives.

## **6.11 Disposal of condemned material**

Some low throughput abattoirs used burial as a means of disposal of condemned material. The environmental impacts of such practice are of concern as the accumulation of waste over time may have negative influences on environmental health. Concern is justified particularly if no environmental impact studies have been done to allow for disposal of such waste at particular dumping site. Such is the case as observed during this study. The department of Veterinary Services is currently developing a waste disposal manual that may address this issue. These guidelines may be integrated into HMS implementation guidelines.

## **6.12 Corrective action and continual improvement of the HMS**

Non-conformances observed during internal audits are intended to provide the basis for improvement. Root causes of non-conformance should be integrated back into the existing HMS procedures and the system in general. During the research it was found that corrective action and continual improvement was less than adequate. More importantly the extent to which the HMS supports continual improvement is unclear as no specific requirements provides for this. Further research in this regard is necessary.

# **7. RECOMMENDATIONS**

Involvement by industry organisations e.g. the South African Poultry Association (SAPA) in assisting poultry abattoir operators in training may greatly support the poultry meat industry. Such training may improve hygienic practices at poultry abattoirs and may advance the implementation of the HMS.

Government is reluctant to develop implementation guidelines for industry because it is viewed as a conflict of interest. However government should be involved to some degree in the development of the guideline to clarify and simplify compliance. This is yet another case for industry organisation to play a role in the support of the poultry meat industry.

It is proposed that the guidelines be developed to clarify government expectations regarding primary and secondary meat inspections. In addition, government should clarify the obligation of abattoir owners to ensure sufficient inspection staff for the range of tasks for which inspectors and veterinarians are responsible for at poultry abattoirs.

Government and industry may work together towards closing gaps between the documented HMS and operational practice in order to promote the practical benefits of the HMS as a management tool toward control. Government should also promote awareness of internal audits by operators using HAS because the HMS will stagnate and over time rendering it redundant should internal audits not be conducted.

It is recommended that further research be done into determining the extent to which the requirements of the HMS supports continual improvement as contemplated within contemporary food safety and quality management system such as those published by the International Organisation for Standardisation. Research is also required to validate the effectiveness of the HMS in managing meat safety contamination risks. Research is also required to validate the HAS as an effective predictor of hygiene at abattoirs.

Finally, inadequate implementation of the HMS cannot be explained simply as unwillingness by abattoir operators to implement and maintain the system. There may be barriers to implementation such as attitudes, perceptions, awareness and understanding as well as resource issues that may impede compliance. For this reason, is important to understand these constraint factors that may impede the advancement in the implementation of the HMS. Once these factors are known, both government and the industry can work together to overcome them towards the advancement in implementation of the HMS.

## **8. CONCLUSION**

The commitment of poultry abattoir operators to comply with government regulations is clearly evident as seen by the varied attempts to develop and implement the HMS. This is despite challenges that abattoir owners/managers face in terms of limited resources, expertise as well as the lack of guidelines to implement the HMS.

Compliance was generally higher at high throughput abattoirs than low throughput abattoirs. This could perhaps be related to constraints low throughput owners face such as limited resources and lack of expertise. Another constraint factor may be a lack of general awareness of the importance of the HMS as a food safety management tool.

Development of guidelines using themes proposed in this study may promote the development of more effective HMSs.

Such guidelines may assist greatly with advancing the implementation of the HMS to a point where continual improvement of the system may be contemplated.

Perhaps the appropriate authority to actually develop the proposed guidelines would be the DAFF. The DAFF sets national standards and monitors provincial veterinary services. Their involvement will greatly enhance standardisation nationally regarding the interpretation of the HMS requirements, and implementation thereof. Involvement of provincial veterinary services, abattoir representatives and non-governmental organisations will certainly add value when developing the proposed guidelines.

## **9. ACKNOWLEDGEMENTS**

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