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Comparing non-compliances and non-conformities: The different points of view of pig slaughterhouse operator, competent authority and customers

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ABSTRACT

The food business operators (FBOs) hold the main responsibility for food safety, based on the Regulation (EC) No 852/2004 and realized by the application of the hazard analysis and critical control point (HACCP) principles. They should implement a self-checking system (SCS) and may adopt voluntary food safety management system based on international standards, that are believed to strengthen HACCP functioning. Both official controls conducted by the Competent Authorities (CAs) and private voluntary standards play essential roles in maintaining food safety. In addition, customer complaints are highlighted as valuable feedback for FBOs, contributing to continuous improvement efforts. The present study aimed (i) to compare the non-compliances assigned by the CA during official inspections and audits carried out in a large slaughterhouse with the non-conformities registered by the FBO in the SCS during a five-year period, (ii) to evaluate, in the same period of time, the customer complaints managed by the FBO as non-conformities being part of the Food Safety Management System, and (iii) to examine potential overlapping of SCS and official controls. The majority of non-conformities/non-compliances in the slaughterhouse were related to the finding of non-conforming products, maintenance deficiencies, and lack in housekeeping and hygiene. The types of observations varied among the three groups—FBO, CA, and customers—with different areas of focus. Both official controls and SCS are of crucial importance and can sometimes overlap, but the suggestion to reduce the frequency of official inspections should not be considered because such controls have different values and are both crucial. Moreover, those controls should nevertheless be complemented by attentive consideration of customer complaints.

1. Introduction

In the European Union (EU), primary responsibility for food safety rests with the food business operator (FBO) (Regulation (EC) 178/2002, Regulation (EC) No 852/2004). FBO is best placed to devise a safe system for supplying food and ensuring that the food is safe (Regulation (EC) 178/2002). Food safety evaluation in slaughterhouses is not a single-criterion issue (Codex Alimentarius Commission, 2005). It depends mainly on the maintenance of hygiene procedures during slaughtering, cutting, cold storage, and meat transportation, and must ensure compliance with food law requirements (Codex Alimentarius Commission, 2005; Regulation (EC) No 853/2004). However, meat safety also depends on many other conditions such as Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP), site and personal hygiene, product control, process control (Antunović et al., 2021; Jakubowska-Gawlik et al., 2022; Panea & Ripoll, 2020). For these reasons, FBOs must establish and manage food safety programmes and procedures based on the hazard analysis and critical control point (HACCP) principles and implement a self-checking system (SCS). SCS focuses on the internal processes, practices, and procedures within the food-producing plant. It includes activities such as prerequisite programmes, hazard analysis, monitoring of critical control points, implementation of corrective actions, and records keeping, and it is an instrument to help FBOs attaining a higher standard of food safety (Regulation (EC) No 852/2004).

In addition, many FBOs implement voluntary food safety management systems (FSMSs) based on international standards such as the British Retail Consortium Global Standard (BRCGS), the International Featured Standards (IFS), (BRC, 2022; IFS, 2023) or those belonging to the family of International Organization for Standardizations (e.g. ISO 22000:2018; ISO 9001:2015) (Du, 2018; Fernández-Segovia et al., 2014; Kotsanopoulos & Arvanitoyannis, 2017; Mensah & Julien, 2011; Nguyen & Li, 2022; Qijun & Batt, 2016). All these private voluntary standards, in addition to public regulations, assist food businesses to fully understand

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the products they produce, manufacture, and distribute, and help the FBOs to set up a system to identify and control the hazards that are significant for the product safety, authenticity, legality and quality (BRC, 2022). For these reasons, voluntary FSMSs are believed to strengthen HACCP functioning (Trafialek & Kolanowski, 2017; Turku et al., 2018).

The HACCP system and the voluntary certifications do not replace official controls (Regulation (EC) 852/2004) and FBOs are subjected to official food control performed by the local and national Competent Authorities (CAs) to ensure compliance with food safety legislation and thus food safety (Regulation (EU) 625/2017, Regulation (EU) 627/2019). In slaughterhouses, official control relies on measures to ensure safe meat for consumers, secure the welfare of animals, and prevent transmissible animal diseases (Alban et al., 2011; Buncic et al., 2019; European Food Safety Authority (EFSA), 2011; Regulation (EU) 625/2017, Regulation (EU) 627/2019). Finally, official controls are performed to verify slaughterhouse compliance with food safety legislation including proper implementation of mandatory SCSs. In EU countries, the frequency of the official controls can be reduced according to the risk categorization of the food businesses (Regulation (EU) 625/2017, Regulation (EU) 627/2019), but official controls at the slaughterhouse are performed on a daily basis. Both official controls and the HACCP system have their strengths and play important roles in ensuring food safety. Official controls provide regulatory oversight and ensure compliance with legal requirements, while the HACCP system empowers food plants to proactively manage risks and implement customized control measures (Conter et al., 2007; Dzwolak, 2019; Rossi et al., 2020).

Finally, customer complaints are valuable feedback for FBOs and play an important role in the SCS of food-producing plants. They provide insights into potential issues, drive continuous improvement efforts, help in root cause analysis, and contribute to the overall effectiveness of the SCS in ensuring food safety and quality in food-producing plants (Doğan & Ay, 2020; Food Safety and Inspection Service (FSIS), 2020). Legislation covering food safety differs in detail worldwide, nonetheless, in the EU, enterprises are not required to develop and maintain a program that addresses the management of complaints, even if it could be an important part of the risk management strategy. On the contrary, most voluntary standards require a complaint handling: customer complaints shall be handled effectively, and information used to reduce recurring complaint levels. Most importantly, all complaints shall be investigated, and root cause analysis shall be carried out to avoid recurrence (BRC, 2022; ISO 10002:2018).

The FBO usually has to handle non compliances, referred to the situation wherein a product/material fails to meet the legal requirements specified by the regulatory authorities, and non-conformities, referred to a deviation from a specification, a standard, or an expectation defined by the FBO. Very few studies present a comprehensive investigation of the NCs in slaughterhouses (Luukkanen & Lundén, 2016) and the comparison of the level of conformity between CA and FBO. Moreover, to the best of authors' knowledge, no research added the customer complaints received by food companies to this assessment. The aims of the present study were (i) to compare the non-compliances assigned by the CA during official inspections and audits carried out in a large slaughterhouse with the non-conformities registered by the FBO in the SCS during a five-year period, (ii) to evaluate, in the same period of time, the customer complaints managed by the FBO as non-conformities being part of the Food Safety Management System, and (iii) to examine potential overlapping of SCS and official controls, in order to hypothesize the possible reduction in frequency of official controls.

2. Materials and methods

2.1. Data collection

The study was conducted in a high-throughput abattoir located in Lombardy region (Northern Italy). The abattoir had a daily output of about 3000 heavy pigs, mainly destined for the Italian Protected Designation of Origin (PDO) products chain and slaughtered at a live weight of ~170 kg and at least 9 months of age. The staff was composed by more than 400 people, most of them were subcontracted workers, and representing a wide range (25) of nationalities. At the end of the slaughter process, the half-carcasses were immediately boned and cut. The majority of the meat was dispatched on the same day of slaughter. The meat produced by the abattoir was 100% business to business and the main customers were large-scale distribution, fresh meat retailers, meat-based food producers, especially cured hams or dry fermented products, most of them certified with the international standards and belonging to the PDO production chain.

The slaughterhouse was subjected to daily inspection by the local CA, usually composed by four or five official veterinarians. It was authorized by the Ministry of Health for export to the most important meat markets worldwide and it was certified with the international standards BRC Food Safety Standard and UNI EN ISO 9001 to comply with the main Italian and European large-organized distribution.

Data of non-compliances observed in official inspections and audits, and non-conformities recorded by the FBO during the SCS activities over the years 2017–2021, were collected. Furthermore, customer complaints received via mail, overseen by the quality area supervisor, have been taken into account. Once evaluated, investigated, and substantiated, these complaints were treated as non-conformities and recorded in the SCS by the FBO.

It should be noted that part of the research time considered in the present study coincided with the COVID-19, declared a pandemic by the World Health Organization (WHO) on March 11, 2020 (WHO, 2020). Considering the fundamental role of animal slaughter in the food supply chain, and after the due verifications by the CA regarding the respect of the prescribed safety measures, the production never stopped. During the pandemic, the company confirmed the implementation of hygiene procedures already in place, such as the correct use of personal protective equipment, regular hand washing, use of hand sanitizers, wearing masks and gloves, and the maintenance of a prescribed distance between personnel, as described by the guidelines issued by public health authorities. The only novelty was the remodelling of the working shifts of some areas, to allow the correct spacing of the working staff in the changing rooms, but these measures did not affect the results of this study.

In order to compare all the deviations from the requirements of the CA (official non-compliances), the FBO (internal non-conformities), or the customers (substantiated complaints), all non-compliances/non-conformities (NCs) were assigned to the corresponding subsection of the BRCGS issue 9 (BRC, 2022).

2.2. Statistical analysis

Categorical variables were summarized using percentages and relative frequencies.

To explore the relationship among the groups of NCs (official, internal, and complaints), the Chi-Square Test for Independence was used. Two-tailed p value < 0.05 was considered statistically significant.

In order to measure the inter-rater reliability between FBO and CA, the Kappa Measure of Agreement test was used. This test represents the extent to which the data collected in the study are correct representations of the variables measured and compares the probability of agreement to that expected if the ratings are independent. The values of range lie in [−1, 1] with 1 presenting complete agreement, 0 indicating agreement being no better than chance (meaning no agreement or independence), and negative values indicating worse than chance agreement. (McHugh, 2012).

All the statistical analyses were performed in SPSS 28 (IBM Corp. Released 2020, IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY, USA: IBM Corp).

3. Results

Overall, a total of 325 NCs were recorded during the five-year period 2017–2021. Tables 1 and 2 show the frequency of NCs assigned by the FBO, the CA, or registered following customer complaints.

Among all the NCs detected during the five-year period considered in the present study by the FBO, the CA, or registered following customer complaints, the majority were assigned to Control of non-conforming products (18.5%), Maintenance (13.8%), Housekeeping and hygiene (17.8%), Control of operations (11.7%), and Personal hygiene (16.0%) (BRCGS issue 9 subsections 3.8, 4.7, 4.11, 6.1, and 7.2, respectively) (Table 3). Significant differences were observed in the type of NCs reported among the three groups (FBO, CA and Customers) ($p < 0,01$ Chi-Square Test for independence).

The most common cases of NCs observed by FBO were related to Control of Non-conforming products, Housekeeping and hygiene, Maintenance, Control of operations and Personal hygiene. CA observed NCs mainly on Housekeeping and hygiene, Maintenance, Control of operations, whereas NCs following Customer complaints were mainly due to Specifications, Control of Non-conforming products, and Housekeeping and hygiene (Fig. 1).

Table 4 shows the number of NCs with a potential impact on food safety, based on the origin of the NC (FBO, CA, and Customer complaints). Among them, NCs related to foreign bodies, bad hygiene procedures on meat or on equipment, wrong personnel behavior with an impact on meat hygiene, contamination of meat, etc., have been considered. The NCs related to management of by-products, maintenance of external areas, customer specifications, system documentation or animal welfare, were excluded from the total count.

The evaluation of the agreement between the type of NCs recorded by FBO and CA resulted in a Kappa Measure of Agreement value of 0.000. This value indicates no concordance in the classification of NCs between the two groups (Fig. 1).

The majority of NCs was assigned in the hot deboning room (Fig. 2). In that area, 62.2% of NCs were due to customer complaints, frequently due to failure to comply with the customer's commercial requirements or foreign bodies contamination arising from equipment damage or pieces of bones. Other critical areas were the slaughtering room, cold deboning room, cold rooms and changing rooms, but in those cases the highest number of NCs were assigned mainly by FBO or CA. The NCs concerning quality assurance and management system (e.g., senior management commitment, HACCP procedures and manuals, work instructions, etc.) and at lairage were assigned mainly by the CA. On the contrary, in the cold deboning areas and in the changing room NCs were recorded almost only by the FBO. Significant differences were observed in the distribution of NCs in the several working areas of the plant (hot deboning room, slaughtering room, cold deboning room, cold rooms and changing rooms) based on the origin of the NCs (FBO, CA and Customers) ($p < 0.01$ Chi-Square Test for independence).

The evaluation of the agreement between FBO and CA, based on the area in which the NCs were recorded, resulted in a Kappa Measure of Agreement value of 0.005. Again, this value indicates no concordance in the classification of NCs between the two groups.

The distribution within the plant of the NCs recorded in the main BRC subsection (ie those that recorded the highest number of NCs) is shown in Fig. 3. Non-conforming products, often resulting from foreign body contamination, were found especially in the hot deboning room, in which the greatest number of NCs were found. Deficiencies in housekeeping and hygiene, mainly due to equipment not maintained in clean and hygienic conditions, were detected especially in the deboning rooms (hot and cold deboning areas) as well as in the washing area. Failing in the maintenance of the premises and equipment resulting in failure to maintain the integrity of machineries and devices, walls, floors, building fabric, etc., led to NCs especially in the hot deboning room, and, to a lesser extent, both in the washing area and in the cold rooms. The failure to comply with the control of operations, i.e., lack of respecting the work instructions, as well as the storage conditions and temperatures, led to NCs observed in the cold rooms, in the slaughter area and at lairage. Finally, the personal hygiene standards, such as compliance with proper workwear, appropriate hand-washing on entry to the production areas, were not met in the changing room and in the deboning areas (hot and cold deboning). Significant differences were observed in the distribution of the main group of NCs in the different working areas of the plant ($p < 0.01$ Chi-Square Test for independence).

Table 1
Overall number and source of NCs recorded during the five-year period.

NC Origin	Frequency	Percent
FBO	128	39.4
CA	86	26.5
Customers	111	34.2
Total	325	100.0

Table 2
Frequency of NCs assigned by the FBO and the CA or recorded following customer complaints.

Year	2017	2018	2019	2020	2021
FBO	41.9	45.9	36.5	31,5	40.3
CA	28.4	42.6	40.5	38.9	21.0
Customers	29.7	11.5	23.0	29.6	38.7

Table 3
Overall distribution of assigned NCs, based on the BRC subsections concerned, during the five-year period considered (BRC, 2022).

BRC Section	BRC Subsection	Description	Percent
2. The Food safety plan - HACCP	2.3	Describe the product	0.3
3. Food safety and quality management system	3.1	Food safety and quality manual	0.9
	3.5	Supplier and raw material approval and performance monitoring	0.3
	3.6	Specifications	5.8
	3.8	Control of non-conforming products	18.5
	3.9	Traceability	3.7
4. Site standard	4.3	Layout, product flow and segregation	3.1
	4.4	Building fabric, raw material handling, preparation, processing, packing and storage areas	0.3
	4.6	Equipment	1.5
	4.7	Maintenance	13.8
	4.8	Staff facilities	0.6
	4.11	Housekeeping and hygiene	17.8
	4.12	Waste/waste disposal	0.6
	4.14	Pest management	1.2
5. Product control	5.2	Product labelling	0.6
	5.4	Product authenticity, claims and chain of custody	0.3
6. Process control	6.1	Control of operations	11.7
	6.2	Labelling and pack control	2.2
	6.4	Calibration and control of measuring and monitoring devices	0.3
7. Personnel	7.1	Training: raw material handling, preparation, processing, packing and storage areas	0.3
	7.2	Personal hygiene: raw material-handling, preparation, processing, packaging and storage areas	16.0
		Total	100.0

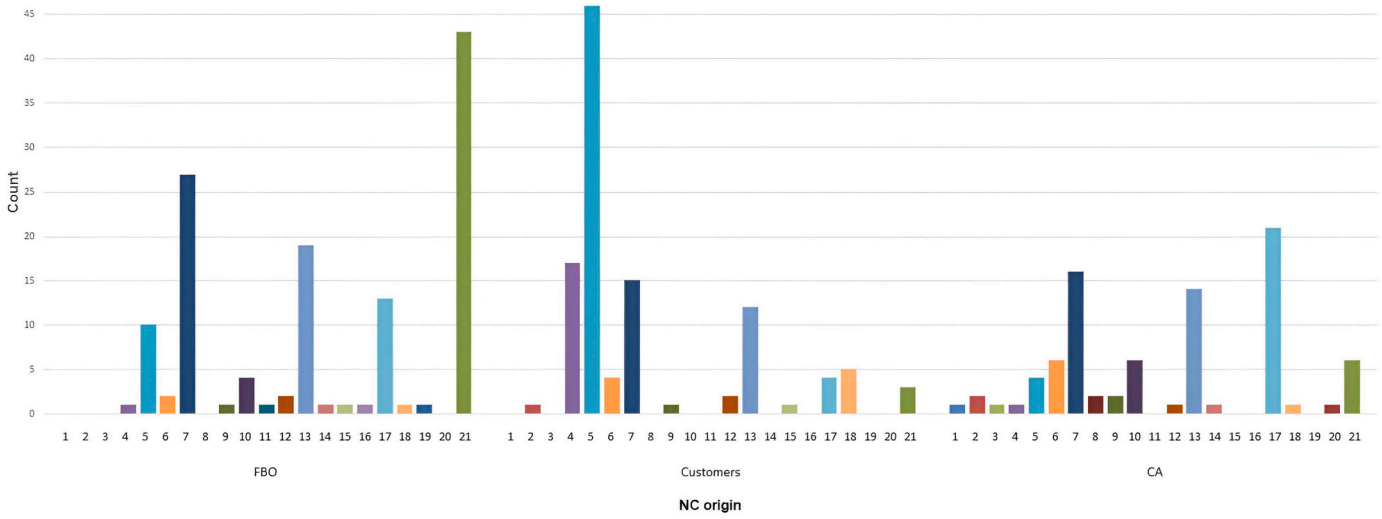

Fig. 1. Distribution of the number of NCs assigned by FBO, Customers or CA, belonging to the different BRC subsections, during the five-year period considered. 1) HACCP) Describe the product; 2) Food safety and quality manual; 3) Supplier and raw material approval and performance monitoring; 4 – Specifications; 5) Control of non-conforming products; 6 – Traceability; 7) Housekeeping and hygiene; 8) Waste/waste disposal; 9) Pest management; 10) Layout, product flow and segregation; 11) Building fabric, raw material handling, preparation, processing, packing and storage areas; 12 – Equipment; 13 – Maintenance; 14) Staff facilities; 15) Product labelling; 16) Product authenticity, claims and chain of custody; 17) Control of operations; 18) Labelling and pack control; 19) Calibration and control of measuring and monitoring devices; 20) Training: raw material handling, preparation, processing, packing and storage areas; 21) Personal hygiene: raw material-handling, preparation, processing, packaging and storage areas.

Table 4
Number and origin of NCs registered during the five-year period considered, having potential impact on food safety.

NC Origin	Frequency	Percent
FBO	57/325	17.5
CA	32/325	9.8
Customers	68/325	20.9
Total	157/325	48.3

4. Discussion

Previous studies have shown similarities and overlap in official food control inspections and FSMS audits (Anonymous, 2013; CFIA (Canadian Food Inspection Agency), 2019; Martinez et al., 2013; Turku et al., 2018; Verbruggen & Havinga, 2015; Wright et al., 2013), advocating for the utilization of certified FSMSs in official control (Dzwolak, 2017; Fernàndez-Segovia et al., 2014; Psomas & Kafetzopoulos, 2015; Qijun & Batt, 2016) Certification can be considered to ensure that the plant has a better average standard because maintaining certification implies continuous control of hygiene, operations, and documentation. However, the results of official inspections and third-party audits are not necessarily equivalent (Piira et al., 2021; Turku et al., 2018): a major

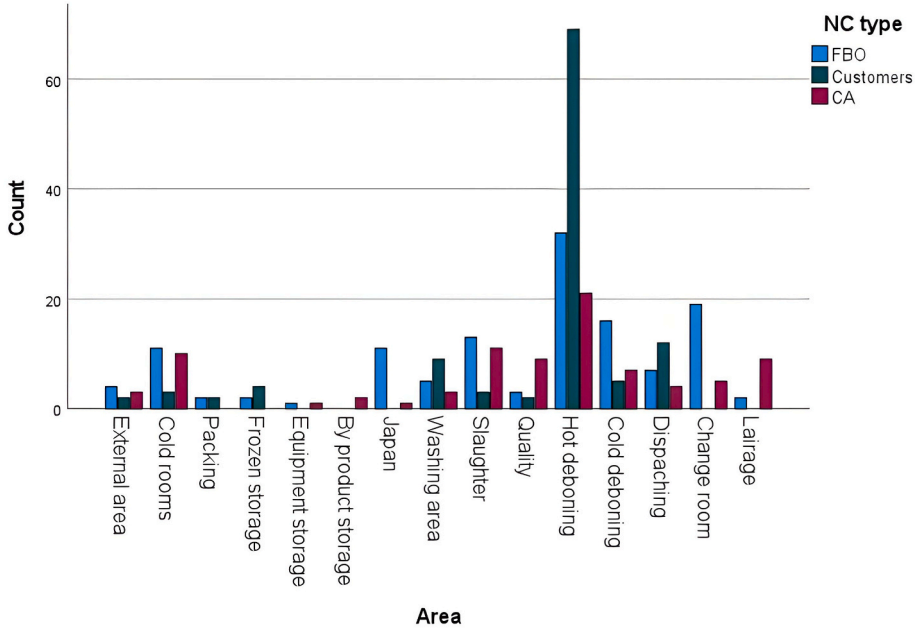

Fig. 2. Distribution of the number of NCs on the different areas of the plant based on the origin of NCs.

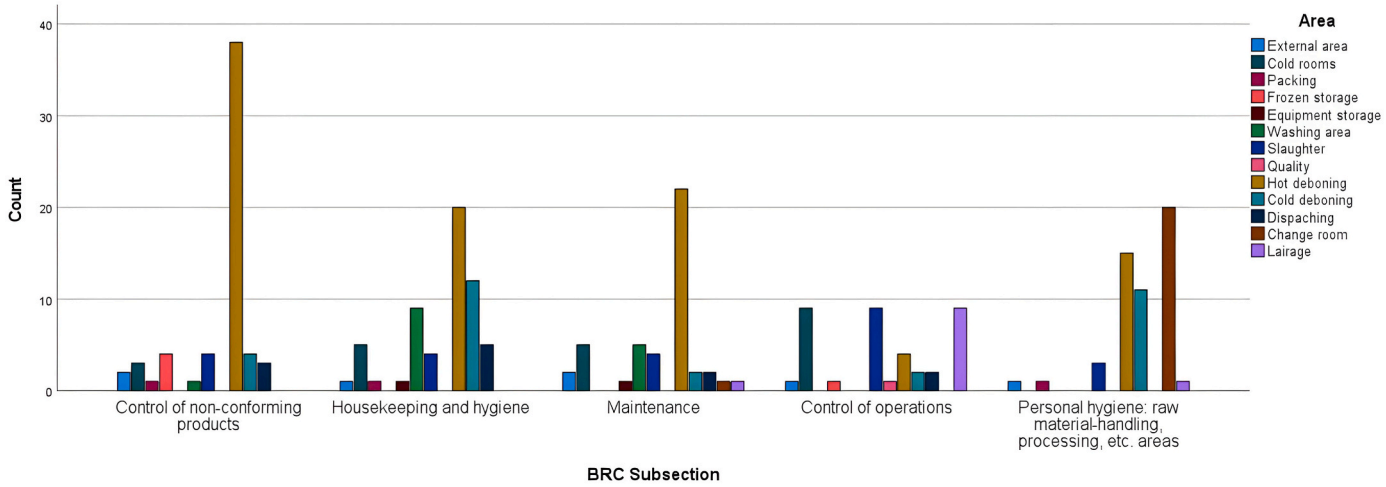

Fig. 3. Distribution of the main groups NCs in the plant areas.

difference is that official control is independent from food businesses, with the primary aim of safeguarding consumers (Regulation (EU) 625/2017, Regulation (EU) 627/2019), whereas the certification bodies are part of the market economy (Martinez et al., 2013). In addition, it is the practice of the CA to periodically impose a rotation of the official control staff in order to reduce any conflict of interest and increase the impartiality of controls, as suggested by the European legislation and international standards on the performance of audits (ISO 19011:2018; Regulation (EU) 625/2017). Moreover, third-party audits are most often carried out annually (BRC, 2022; IFS, 2023), and the FBO is usually aware of the audit process well in advance, while official inspections at the abattoir, although some of them are planned on a daily-basis (pre-operative and operative inspections), are always performed unannounced. For these reasons, the NCs due to the certification audits experienced by the slaughterhouse were not taken into account in the present study. Instead, the control activities carried out on a daily basis, from different points of view and with different roles, by the FBO, the CA and, with a still different value, by the customers, have been compared by analysing the outcomes of the surveillance, i.e., non-conformities and non-compliances.

Altogether, the majority of NCs was due to hygiene deficiencies, i.e., Housekeeping and hygiene (17.8%), and Personal hygiene (16.0%), followed by the identification of non-conforming products (18.5%). In other studies, more than half of all non-compliances in slaughterhouses were related to hygiene deficiencies (Lueckl et al., 2019; Luukkanen & Lundén, 2016). Nevertheless, significant differences were observed in the type of NCs recorded among the three groups (FBO, CA and customers). For the FBO, the control of the personnel is certainly important, being carried out through the verification of Personal hygiene (BRC subsection 7.2). The CAs were focused, instead, on the Control of Operation (BRC subsection 6.1) and, ultimately, to the verification that production of safe and legal products was guarantee, in full compliance with the HACCP plan. Finally, as expected, NCs due to customer complaints were mainly focused on failures to meet the required commercial specifications, more than failures in the compliance with food safety requirements. The number of NCs that may have an impact on food safety and reach the consumer (thus excluding those related to customer commercial specifications, system documentation or animal welfare, etc.) respects the proportion of what we call the "pyramid of NCs" that provides that the majority of NCs should be detected and managed by the FBO, followed by those assigned by the CA (Fig. 4).

Overall, the majority of NCs were assigned to the hot deboning room, where there was the highest concentration of workers and activities and the NCs can have direct effect on the final product and the customers. In other areas, such as the slaughter line, the cold deboning rooms, and

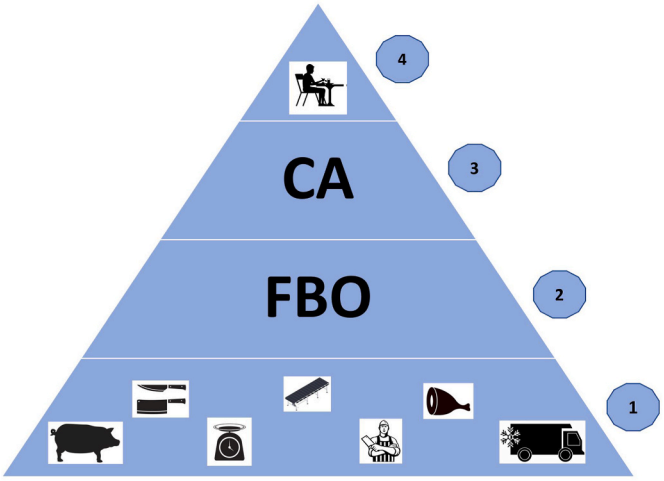

Fig. 4. The pyramid of NCs. 1) overall NCs present in the plant, 2) NCs detected by the FBO, 3) NCs detected by the CA, 4) NCs reaching the consumer.

cold rooms, a high number of NCs were assigned mainly by FBO or CA, respecting the cited pyramid of NCs. The same can be noted for the NCs in the changing rooms, but in this case the differences between FBO and CA can be due to the primary objective of staff control planned by the food business. Noteworthy, the NCs in the quality assurance and management system and at lairage were assigned mainly by the CA. In the first case, it suggests that the quality manager may not have a balanced or impartial assessment during the self-inspection process and may be influenced in making judgements on their own work, as required by the common rules on audit process (ISO 19011:2018, BRC, 2022). In the second case, NCs recorded at lairage were mainly due to animal welfare problems, suggesting a higher sensitivity of the CA in this matter. Nonetheless, it should be noted that many NCs with a potential food safety impact have reached the customer (68 out of 111, 61.3%). Among them, most (45/68, 66.2%) were due to the presence of foreign bodies, highlighting hygienic deficiencies, lack in the maintenance of buildings and equipment and, above all, in control deficiencies by the working staff. The corrections and the corrective actions of the NCs related to facilities are often the most expensive ones to accomplish, which, in turn, may affect the perceptions on the true need for the corrections by the FBOs (Jakubowska-Gawlik et al., 2022; Mari et al., 2013). On the other hand, management of working staff, especially when originating from different countries and with difficulties in proper language

speaking and comprehension, can be a challenge both for FBO and the CA. Another research reported food safety/HACCP control, site hygiene, and pest control as the critical criteria requiring improvement in slaughterhouses (Jakubowska-Gawlik et al., 2022).

It is important to remember that customers have the right to expect that the foods they purchase is safe and of high quality. Even though consumers and governments play an important role in ensuring food safety and quality, nonetheless in free-market societies the ultimate responsibility for investing physical and managerial resources which are necessary for implementing appropriate controls lies with the food industry (Regulation (EC) 178/2002). While this is true, private companies recognize that their success - measured in terms of profitability – relies on customer satisfaction. Customer complaints play an important role in a SCS for several reasons: Customer complaints serve as an early warning system for identifying potential issues with food safety or quality. By promptly addressing and investigating these complaints, the FBO can identify and rectify any underlying issues in its processes. By tracking and analysing customer complaints, the FBO can identify trends and patterns, enabling to take corrective actions and prevent similar issues from occurring in the future. Moreover, customer complaints are an essential source of information for conducting root cause analysis. This analysis helps in identifying weaknesses or gaps in the SCS and enables the plant to implement appropriate corrective measures. Customer complaints trigger corrective and preventive actions within the SCS. When a valid complaint is received, the plant should promptly address the issue, rectify the problem, and prevent its recurrence. Finally, customer complaints can also have regulatory implications. If a complaint raises concerns related to food safety regulations or legal requirements, the food-producing plant must address the issue promptly to ensure compliance with the regulations in force. This ensures that the SCS aligns with regulatory standards and protects public health.

For all these reasons, the attention of the FBOs during food production should be driven by the needs of customers, in addition to the pursuit of the safety of the food they produce and sell, considering that the two features in most cases are overlapping.

If it were true that the more frequent the visits by the CA are, the more positively it seemed to influence to the FBOs' attitudes towards the control (Kosola et al., 2022; Mari et al., 2013; Nevas et al., 2013), the permanent control and supervision by the official veterinarians at the abattoir, should positively influence the activity of the FBO. In fact, in the present study, the FBO' positive attitudes towards controls can be confirmed by the higher number of NCs recorded by the FBO than the CA. Moreover, the statistical difference in type and number of NCs between FBO and CA support this hypothesis, underling, at the same time, their different point of views and purpose. Notwithstanding this study is limited to a single slaughterhouse, it should be considered that it has been conducted over a considerable time span. This allowed to take into account the turnover of several official veterinarians over the years, the occurrence of different non-compliant situations, both during the SCS and including those reported by the customers. In this way it has been possible to assess the different circumstances, which can be representative of what happens in a high-throughput slaughterhouse.

It is important to investigate the comparability of official inspection and self-checking control. Definitely, one must take into account the inherent conflict of interest for the FBO auditor when assigning NCs to their own company. There is a likelihood that some NCs are addressed without leaving any documented evidence. Moreover, discrepancies in the type of NCs between FBO and CA can be due to different reasons, such as the ability of both to recognize them (Turku et al., 2018), their sensitivity on specific topics or even their training background. In the current investigation, it is challenging to attribute those inconsistencies solely to the differences in timing between official- and self-checking controls or the lack of advanced notice for official inspections, as reported by other studies on different outcomes between pre-announced or unannounced controls (Albersmeier et al., 2009; Jacxsens et al., 2015; Kosola et al., 2022; Läikkö-Roto et al., 2015; Törmä et al., 2019). Slaughterhouses have indeed full-time official inspectors on-site and, despite the different planning between audits and inspections, veterinary supervision is continuous, as well as the food safety management by the FBO in the daily routine.

5. Conclusions

Primary responsibility for ensuring food safety rests with the FBO, that must establish and manage food safety programmes implementing a proper SCS. On the other hand, the CA is responsible for carrying out official controls to verify FBOs' compliance with food safety requirements. Finally, NCs due to customer complaints are an important source in identifying and uncovering food safety issues and they should thoroughly be analysed included into the official activities carried out by the CA, even though they are not included in CA official tasks.

In the present study, the types of remarks varied among the three groups—FBO, CA, and customers—with different areas of focus. For the FBO, the control of the personnel and related hygiene was fundamental, whereas the CA was primarily centred on the slaughtering operations, assuring the production of safe and legal products. Customers were rather focused on failures to meet the required commercial specifications.

Although there is an overlap between CA and FBO controls in slaughterhouse, it can be concluded that they have different objectives and are both crucial. Due to this overlapping, suggestions to reduce the frequency of official inspections are commonly proposed. Anyway, any reduction should not be considered unless similarity in NCs detection by FBO and CA is reached over the time, in compliance with the cited pyramid of NCs. This investigation should take into account both NCs assigned by the CA and internal NCs and even those managed by the FBO following customer complaints.

CRediT authorship contribution statement

Mauro Conter: Writing – original draft, Formal analysis, Conceptualization. **Martina Rega:** Writing – review & editing, Data curation. **Luca Lamperti:** Writing – review & editing, Data curation. **Laura Andriani:** Writing – review & editing, Software, Formal analysis. **Cristina Bacci:** Writing – review & editing, Supervision. **Silvia Bonardi:** Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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