

Gross Pathological Study On Pulmonary Lesions Of Cattle Slaughtered In Kombolcha Elfora Abattoir, Southern Ethiopia

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Abstract: A cross-sectional study was conducted from November, 2015 to April, 2016 to assess the major causes of pulmonary lesions in cattle slaughtered at Kombolcha elfora abattoir, based on gross pathological examination. Out of the total 384 cattle examined during ante-mortem examination, 37(9.7%) animals were having different clinical signs during physical examination. From the observed abnormalities, tick infestation 12(3.1%), lameness 7(1.8%), depression 6(1.6%) and respiratory signs 4(1.1%) were abnormalities which have been detected at a higher percentage during ante-mortem examination. Postmortem examination was performed carefully on the 384 cattle slaughtered at the abattoir. During postmortem examination the major causes of pulmonary lesions are hydatidosis 30(7.81%), lung worm 26(6.77%), emphysema 26(6.77%), tuberculosis 24(6.25%), pneumonia 24(6.25%), abscess 18(4.68%) and calcification 16(4.16%) which were the main causes of lung rejection during meat inspection. Out of those cattle slaughter, 164 (42.70%) of lungs were condemned because of one or more abnormalities. There was not statistically significant difference ($p > 0.05$) in the lung condemnation rate among the age, sex and breed of animals. However, body condition score of animals were found to be significant influence on the lung condemnation rate ($p < 0.05$). The possible causes for the occurrence of the lesions are discussed and the results are compared with works done on cattle in Ethiopia. Therefore, due to lung condemnation result economic losses and hence the present study indicated that immediate need for prevention and control of the cause of pulmonary lesions which lead lung condemnation. Finally based on the results obtained, recommendations are forwarded for further study and for the control and prevention of the pulmonary diseases of cattle.

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1. Introduction

Ethiopia has largest livestock population in Africa, which is estimated to be 53.99% million cattle, 49.56 million sheep and goat, 1.9 million horse, 6.75 million donkey and about 0.92 million camels and 50.38 million chickens (6). Hence, an increase in cattle production could contribute to the attainment of food self-sufficiency in the country particularly in response to protein requirement for the growing human population as well as to enhance the export earnings (13).

Despite the number of population, their potential use is hampered by rampant animal diseases, poor nutrition, poor husbandry; poor infrastructure and shortage of trained man power and other constraints (32). Each year a significant loss results from death of animals, inferior weight gain, condemnation of edible organs and carcass at slaughter. This production loss to the livestock industry is estimated to be more than 900-million USD annually (20). Knowledge of specific causes of organs and carcass condemnation is very important to design and apply effective control measures, improve animal husbandry and avoid some losses related to preventable diseases (11). Data gathered on animals slaughtered at abattoir can be a

convenient and inexpensive source of information. As the matter of the fact, abattoir based survey provide information on the epidemiology of livestock disease extent of exposure public to zoonotic diseases and estimate the financial losses incurred through condemnation of affected organs and carcasses (29).

The world human population is growing at faster rate than food production and this increase is mainly in developing counties, which are unable to assure adequate food for their people. Developing countries have nearly 2/3 of the world's livestock population, but produce less than a third of the worlds meat and fifth of its milk (12). Monitoring and other conditions at slaughter has been recognized as one way of assessing the disease status of herd, however this source of information is not fully exploited worldwide (26). Abattoirs played an important role in surveillance of various diseases of human and animal health importance. Surveillance at the abattoir allows for all animals passing in to human food chain to be examined for unusual signs, lesions or specific disease and main causes of organ condemnation during post mortem inspection are diseases originated by parasites, bacteria and viruses. Flukes in liver and *hydatid cyst* in lung, liver and kidney, are mainly involved (38; 28;

37). Parasites in the tropics are responsible for far greater loss to meat industry than any other disease (20). Similarly like many other tropical countries in Africa, it's well known that parasitic diseases are the major factors responsible for low productivity in live stock in Ethiopia. Although various investigations have been conducted through abattoir survey to determine the prevalence and economic loss resulting from organ condemnation in Ethiopia, most of the surveys were focusing only on parasitic cases such as hydatidosis and fasciolosis (20).

Animal diseases are one of the primary constraints in increasing the productivity of food animals in sub-Saharan Africa. Pulmonary diseases like tuberculosis, *hydatid cyst*, and lung worms are among the most important causes of economic loss due to carcass condemnation and public health problems. Infectious diseases of respiratory tracts of farmed animals are caused by a combination of infectious agents and predisposing factors (10). Under rearing conditions most ruminant livestock harbor some disease conditions without clinical manifestation. During abattoir ante-mortem inspections, hundreds of such animals are passed for slaughter (31;30). The prevalence of pulmonary lesions in Kombolcha has not been previously studied. In view of the importance of the problem, a study will be undertaken with the Following objectives;

- To assess the major pulmonary lesions leading to lung condemnation.
- To determine the association between risk factors and prevalence of pulmonary lesions.

2. Materials And Methods

2.1. Study area

The study was conducted from November 2015 to April 2016 at Kombolcha town which is found in Amhara National Regional State (ANRS) in South Wollo Zone. Kombolcha is located 375Km North East of Addis Ababa at an altitude of 1500-1840 m.a.s.l. The annual average rainfall is 750-900 mm with a mean minimum and maximum temperature of 11.7 and 23.9°C, respectively. The area receives a bimodal rainfall where the short rainy seasons are between March and May while the long rain season extends from June to end of September. The relative humidity of the area varies from 23.9-79%. The total livestock population in and around kombolcha Town recorded that 19687 Cattles, 6905 Sheep, 11133 Goats, 774 Horses, 2629 Donkeys, 77 mules, 29915 poultry, 624 bee colony and 331 male camels (22).

2.2. Study population and sample size determination

2.2.1. Study population

The study population constitutes of local and cross breed cattle originating from different localities

and districts in and around Kombolcha town. The majority of animals slaughtered were local breeds and age wise adult animals took the greater proportion.

2.2.2. Sampling method and sample size determination

To determine the sample size 50% prevalence is used and 95% confidence interval with 5% absolute precision is chosen. The sample size would be determined by the formula given by Thursfield (40).

$$N = \frac{1.96^2 \times P_{exp} (1 - P_{exp})}{d^2}$$

Where N = the total sample size

P_{exp} = expected prevalence

d = absolute precision

2.3. Study Design

The study conducted was basically cross sectional type based on active abattoir survey data investigation.

2.4. Study methodology

2.4.1. Active abattoir survey

A cross sectional study was conducted from November 2015 to April 2016 to identify the major causes of pulmonary lesions of cattle slaughtered at Kombolcha elfora abattoir.

Ante mortem examination

During ante mortem examination of the animals and the relevant information including age, breed, physical condition and health status were recorded. Body condition score of the selected animals were recorded and standard grades given as described by (Nicholson and Butterworth, 1986). The judgments have also been passed on the procedure given by (FAO, 2007).

Postmortem examination

Postmortem examination was conducted by visualization, inspection, palpation and systematic incision of the organ particularly the lung for the presence of abscesses, hydatid cyst, lung worm, tuberculosis, pneumonia, emphysema, calcification and other abnormalities (Gracy *et al.*, 1999). The judgments have also been passed based on the procedure given by (FAO, 2007).

2.5. Data Management and analysis

Collected data was entered in to Microsoft excel and summarized by descriptive statistical methods like percentage and proportion. Then data was also analyzed by using version 20 of statistical package for social science (SPSS) software. The results of this study were considered statistically significant when P value is less than 0.05.

3. Results

During the study period a total of 384 cattle were screened for any gross post mortem pulmonary lesions with the objective of identifying the prevalence of pulmonary lesions encountered on cattle lungs.

3.1. Clinical findings

Physical examination was carried in 384 of the selected animals; in which 9.7% (n=37) had abnormalities during ante-mortem inspection. From the abnormalities tick infestation 3.1% (n=12),

lameness 1.8% (n=7), depression 1.6% (n=6) and Respiratory signs 1.1% (n=4) have occurred relatively at higher proportion than other abnormalities. The major abnormal conditions encountered during physical examination are summarized in (table 1).

Table1: Disease conditions or abnormalities encountered during physical examination.

Disease or abnormalities	Animals with disease or abnormalities (%)		Total (%)
	Young adults(n=145)	Adults (n=239)	
Depression	3(0.8)	3(0.8)	6(1.6)
Respiratory signs	1(0.3)	3(0.8)	4(1.1)
Localized wound	0(0)	3(0.8)	3(0.8)
Lameness	2(0.5)	5(1.3)	7(1.8)
Branding	0(0)	3(0.8)	3(0.8)
Unilateral blindness	0(0)	2(0.5)	2(0.5)
Tick infestation	3(0.8)	9(2.3)	12(3.1)
Total	9(2.4)	28(7.3)	37(9.7)

3.2. Pathological findings

All animals that had been passed in the ante-mortem inspection were subjected to post-mortem examination. A total of 384 cattle (145 young adult and 239 adult age groups) were slaughtered and thoroughly examined by following standard post-mortem inspection procedure. Rates of lung condemnation from the affected lung with its prevalence of pulmonary lesions were hydatidosis 7.81% (n=30), emphysema 6.77% (n=26), lung worm 6.77% (n=26), tuberculosis 6.25% (n=24), Pneumonia 6.25% (n=24), abscess 4.68% (n=18) and calcification 4.16% (n=16) based on gross pathological finding of lungs.

Table 2: Frequency and prevalence of different pulmonary lesions encountered in lungs of cattles slaughtered at Kombolcha elfora abattoir.

Lesion type	Frequency	Prevalence(%)
Hydatidosis	30	7.81%
Emphysema	26	6.77%
Lung worm	26	6.77%
Tuberculosis	24	6.25%
Pneumonia	24	6.25%
Abscess	18	4.68%
Calcification	16	4.16%

Table 3: Distribution of the different pulmonary lesions among age, breed and body condition score.

Variables	Category level	No	Pathology						
			Hydatidosis	Emphysema	Lung worm	tuberculosis	Pneumonia	Abscess	Calcification
Age	Young adult	145	12	8	12	4	7	5	8
	Adult	239	18	18	14	20	17	13	8
	p-value		0.792	0.446	0.361	0.028	0.370	0.371	0.302
Breed	Local	371	28	25	26	23	24	18	16
	Cross	13	0	1	0	1	0	0	0
	p-value		0.301	0.893	0.323	0.827	0.344	0.416	0.444
BCS	Poor	130	9	2	15	13	14	5	10
	Medium	147	15	16	8	8	10	10	3
	Good	107	6	8	3	3	0	3	3
	p-value		0.036	0.008	0.021	0.025	0.003	0.02	0.045

3.2.1. Hydatidosis

Hydatidosis was encountered in 7.81% (n=30) of lungs. They were varied in number from few to

numerous on single lungs. Most of the cysts had calcified or yellowish material inside the capsule but the rest had clear water like fluid.

Table 4: Prevalence of lesions of pulmonary hydatidosis among age, breed and body condition score

Variables	No of examined animals	No of affected animals	Percentage (%)	X ²	p-value
Age	Young adult(145)	12	3.1%	0.069	0.792
	Adult(239)	18	4.7%		
	Total(384)	30	7.8%		
Breed	Local(371)	28	7.3%	1.071	0.301
	Cross(13)	2	0.5%		
	Total(384)	30	7.8%		
BCS	Poor(130)	9	2.3%	2.033	0.036
	Medium(147)	15	3.9%		
	Good(107)	6	1.6%		
	Total(384)	30	7.8%		

3.2.2. Emphysema

Out of the examined 384 cattle lungs, 6.77% (n=26) of the lungs had shown evidence of emphysema. Grossly, the emphysematous lung was

pale, enlarged and puffy. It crepitates on palpation. There was also evidence of rib imprints on the surface of lungs.

Table 5: Prevalence of emphysema among age, breed and body condition score

Variables	No of examined animals	No of affected animals	Percentage (%)	X ²	p-value
Age	Young adult	8	2.1%	0.580	0.446
	Adult	18	4.7%		
	Total	26	6.8%		
Breed	Local	25	6.5%	0.018	0.893
	Cross	1	0.3%		
	Total	26	6.8%		
BCS	Poor	2	0.5%	9.663	0.008
	Medium	16	4.2%		
	good	8	2.1%		
	total	36	6.8%		

3.2.3. Lung worm

Prevalence of pulmonary lung worm infection among the cattle examined was 6.7% (Table 2) and

Clinically affected animals show a sign of loss of appetite, reduced growth, increase respiratory rate and coughing.

Table 6: Prevalence of lesions of pulmonary lung worm among age breed and body condition score

Variables	No of examined animals	No of affected animals	Percentage(%)	X ²	p-value
Age	Young adult(145)	12	3.1%	0.836	0.361
	Adult(239)	14	3.6%		
	Total	26	6.7%		
Breed	Local(371)	26	6.7%	0.977	0.323
	Cross(13)	0	0%		
	Total	26	6.7%		
BCS	Poor(130)	15	3.9%	7.760	0.021
	Medium(147)	8	2.1%		
	Good(107)	3	0.8%		
	total	26	6.7%		

3.2.4. Pneumonia

The prevalence of pneumonic lungs during the study period was 6.25% (n=24) of the total pulmonary lesions. Grossly pneumonic lungs have pleurisy, dark red in color which has a liver like consistency.

Table 7: Prevalence of pneumonia among age, breed and body condition score

Variables	No of examined animals	No of affected animals	Percentage (%)	X ²	p-value
Age	Young adult	7	1.8%	0.804	0.370
	Adult	17	4.4%		
	Total	24	6.2%		
Breed	Local	24	6.2%	0.897	0.344
	Cross	0	0%		
	Total	24	6.2%		
BCS	Poor	14	3.6%	11.741	0.003
	Medium	10	2.6%		
	Good	0	0%		
	Total	24	6.2%		

3.2.5. Pulmonary tuberculosis

Prevalence of pulmonary tuberculosis among the cattle examined was 6.3% (Table 4) and grossly these

lesions have a granuloma and have a number of tubercle lesions distributed in lung, other organs and carcass.

Table 8: Prevalence of Tuberculosis among age, breed and body condition score

Variables	No of examined animals	No of affected animals	Percentage(%)	X ²	p-value
Age	Young adult	4	1.0%	4.847	0.028
	Adult	20	5.3%		
	Total	24	6.3%		
Breed	Local	25	6.0%	0.48	0.827
	Cross	1	0.3%		
	Total	26	6.3%		
BCS	Poor	13	3.4%	5.453	0.025
	Medium	8	2.1%		
	Good	3	0.8%		
	Total	34	6.3%		

3.2.6. Abscess

Abscess was encountered in 4.68% (n=18) of cattle lungs. Grossly, these lesions were 1-3 cm in diameter containing whitish or yellowish thick pus.

Table 9: Prevalence of abscess among age, breed and body condition score

Variables	No of examined animals	No of affected animals	Percentage(%)	X ²	p-value
Age	Young adult	5	1.3%	0.801	0.371
	Adult	13	3.4%		
	Total	18	4.7%		
Breed	Local	18	4.7%	0.662	0.416
	Old	0	0%		
	Total	18	4.7%		
BCS	Poor	5	1.3%	2.528	0.02
	Medium	10	2.6%		
	Good	3	0.8%		
	Total	18	4.7%		

3.2.7. Pulmonary calcification

Prevalence of pulmonary calcification among the cattle examined was 4.2% (Table 7) and grossly these lesions were Irregularly rounded and frequently honey combed and have a gritty sound upon incision with knife

Table 10: Prevalence of calcification among age breed and body condition score

Variables	No of examined animals	No of affected animals	Percentage (%)	X ²	p-value
Age	Young adult	8	2.1%	1.064	0.302
	Adult	8	2.1%		
	Total	16	4.2%		
Breed	Local	16	4.2%	0.585	0.444
	Cross	0	0%		
	Total	16	4.2%		
BCS	Poor	10	2.6%	6.208	0.045
	Medium	3	0.8%		
	Good	3	0.8%		
	Total	16	4.2%		

4. Discussion

Meat inspect

And also Gracey (19) suggested that meat inspections was conducted in the abattoir for the purpose of screening and removing animals products with pathological lesions which are unsafe for human consumption and having poor aesthetic value. It was indicated that meat inspection assists in monitoring disease in the national herd and flock by providing feedback information to the veterinary service to control or eradicate disease and to produce wholesome products and to protect public from zoonotic hazards. The present study assesses the type and frequency of gross pulmonary lesions encountered in cattle lungs slaughtered at Kombolcha Elfora Abattoir.

In present study, the most commonly encountered abnormalities during ante-mortem inspection were tick infestation 12(3.1%), lameness 7(1.8%), depression 6(1.6%), and respiratory signs 4(1.1%). In this study; only depressed animals encountered during ante-mortem examination were delayed from being slaughtered. Tekla (38) reported that diseased animals that show signs of abnormality during ante-mortem inspection should not be allowed to enter the slaughter house for slaughter. Out of the total 384 cattle examined during ante-mortem inspection, abnormalities were detected in 9.7% (n=37). This study was in line with Getachew (18) signs such nasal discharge, coughing and depression were the most probably related to stress due to lack of feed and water, immune suppression and overcrowding during transportation. Similarly, Regessa *et al.* (2013) reported that most causes of lameness was trauma caused by inappropriate vehicles and loading and off-loading negligence during transportation to market places and to the abattoir.

Out of 384 cattle lungs examined, 42.70% (n=164) were found with one or more pulmonary lesions. Of those causes hydatidosis and emphysema were the most important causes of pulmonary lesions. There was statistically significant difference between body condition score in the prevalence of lung (p<0.05). However, the difference between breed, sex and age was not statistically significant with the prevalence of pulmonary lesions, even though there was high prevalence in local breeds. The probable reason for significant difference between body conditions score could be due to acquired immunity in the host.

The current study result in the prevalence of pulmonary lesions by hydatidosis is 7.81% which was lower than the result 19.37% and 12.17% reported by Shegaw *et al.* (36) in Mekelle and Lati *et al.* (25) in wellega respectively. The present study was comparable to 7.95%, 8.4% and 6% observed by Hamdy *et al.* (1980), Pampiglicone (1986) and Abdurahman (1) respectively.

And also the present study is lower 15.2% as reported by kebede *et al.* (24) in Birre-Sheleko and Dangila abattoirs, and 16% in Wolaita Sodo town by Kebede *et al.* (23) and lower than 32.1% by Gebretsadik (2009) in Mekelle. However, the present finding was higher than the report of Alembran and Haylegebriel (2) with 5.1% at Adigrat municipal abattoir. This variation in prevalence of hydatidosis could be due to differences in animal husbandary system, illegal slaughtered of animals, lack of proper disposal of infected carcass and the presence of stray dog which maintain the life cycle of the parasite and their relations with animals Mesele *et al.* (27). Different prevalence results may be reported from the same area due to variations in the number of animals

examined, the duration and months of the study period.

In present study, disease condition in lung was significantly higher in poor body condition animals (18.8%) than medium (18%) and good (6.2%) body condition animals. This finding was disagree with a previous study by Lati *et al.* (25) who reported 23.02%, 25% and 16.66% from animals with good, medium and poor body conditions in wellega municipal abattoir. The differences between body conditions score may be due to animals with poor body condition have low immunity to hydatid disease. Moderate to severe infection the parasite may cause retarded growth, reduced meat and milk production as well as live weight (Polydorou, 1981).

With regards to emphysema in this study accounted 6.77% which is higher than the rate reported by Yifat *et al.* (2012) 1.5% from Gondar but equal the rate reported by Amene *et al.* (2011) 6.77% from Jimma and lower than Genet *et al.* (16) 10.5% from Gondar abattoir. In this study the encountered emphysema could be due to excessive destruction of alveolar walls as a result of an imbalance between proteases produced by phagocytes and antiproteases produced in the lungs as a defense mechanism, secondary to obstruction of outflow of air or agonal at slaughter as indicated (Dungworth, 1993; Lopez, 2001).

In the present study the Prevalence of verminous pneumonia was 6.77% which is statistically significant with the age of the cattle and with the body condition of the cattle ($p < 0.05$). The disease was more likely to occur among the Young adult than adult cattle. This might be due to young adult animals have no previous exposure of diseases as compared to adult animals. The current study is higher to reported by Samuel (35) 0.96% verminous pneumonia and Amene *et al.* (3) also reported similar results from Jimma in western Ethiopia. But, high prevalence of the lesions was reported by Rahman *et al.* (33) in Bangladesh parasitic pneumonia 29.85%. The variation in the present study may be due to agroecology of the area and different management practices of the animals.

The overall prevalence of pneumonia in this study was 6.25%, which is higher than 2.45% Genet *et al.* (16). And lower than 8.8% Raji *et al.* (34) in cattle slaughtered at Zaria. A number of factors may explain in the difference prevalence of pneumonic lungs, including stress factors such as exposure to dust from the environment or exhaustion during travelling of long distance of pastoral livestock in search of pasture and water and when animals are taken to livestock markets or abattoirs and parasitism Benard *et al.* (2011).

In the present study, overall prevalence tuberculosis was 6.25% which was higher than the

results reported by Demelash *et al.* (9) and Teklu *et al.* (39) in Yabello municipal abattoir 4.2% and Hosanna 4.5%, respectively. On the other hand, the present results are less than those of previous reports from Butajira municipality abattoir 11.50% Abdurrohman, (1), Addis Ababa and Adama 10.10% Demelash *et al.* (9), Adama municipal abattoir 24.70% Tefrea, (2009) and 19.8% record from cattle slaughter in rural Tanzania Cleaveland *et al.* (7). This could indicate the endemicity of the disease and high infection rate prevailing in the general population of slaughter cattle in Ethiopia.

In this study abscess was encountered in 4.68% of the cases. This was comparable with and Bekele (2008) who reported 3.85%, and higher than the results of Abdurahman (1) and Ahmed (1998) who reported a prevalence of 0.3%, 1.4% in cattle, respectively. Moreover, this study was lower than prevalence of pulmonary abscess that was recorded by Al-Tarazi, (2001) with a prevalence of 10.34% in cattle. This might be due to Pulmonary abscess arise from either focal residues of severe, supportive lobar or bronchopneumonia or from septic emboli lodging in the pulmonary vascular bed. The most common sources of septic emboli include ruptured hepatic abscess in cattle, suppurative metritis, mastitis, septic arthritis and omphalophlebitis in farm animal and bacterial endocarditis (right side) in all species (Dungworth, 1993; Lopez, 2001). Additionally the two less common causes of pulmonary abscess are aspiration of foreign bodies and direct traumatic penetration of the lungs (Dungworth, 1993; Lopez, 2001; Radostits *et al.*, 2007).

The overall prevalence of calcification in this study was 4.2%, which is comparable with Fufa and Debele (14) who reported 5.32% at Wolatia Sodo abattoire and lower than 10.2% Asmare *et al.* (5) in cattle slaughtered at Bahir Dar municipal abattoir. This might be causing this pathological lesion include viruses, bacteria, rickettsial and helminths that might have zoonotic importance. So, those other causes of organs rejection were important Cadmus *et al.* (2009). In general, high prevalence of pulmonary lesions could be due to the older age of the animals at slaughter with possibility of exposure to one or more of the agents which causes respiratory disease through time at least once, similar to previous observations (Richard, 1979; Bekele, 2008) in camels, (Abayneh, 1999; Solomon, 2007) in cattle and (Islam 1979) in sheep.

5. Conclusion And Recommendations

In this study out of 384 lungs of cattle examined 42.70% were found with one or more pulmonary lesions, indicating pulmonary diseases as an important constraint of cattle production in cattle rearing areas.

The existence of different pulmonary lesions together in one animal indicated that one lesion as a predisposing factors or a sequel to the other lesions. The etiology of pulmonary disease is so complex and multifactorial. Therefore, those lesions encountered in this study may also play a role as a predisposing factors for respiratory disease outbreak under the influence of stress factors such as environmental change, extremes of climatic conditions, transportation and shortage of feeds and water or alone. The respiratory tract is constantly exposed to pathogens from the environment and respiratory commensal organisms. Most cattle had one or more pulmonary lesions on postmortem examination but were apparently healthy during clinical examination. This masks the presence of the disease until necropsy. This together with poor of veterinary service in cattle rearing areas increases the problem of respiratory diseases on cattle production. Taking these facts into consideration the following recommendations are forwarded:

- Further and subsequent studies should be undertaken to investigate pulmonary lesions.
- Detailed studies on the etiology of the different pulmonary lesion should be undertaken.
- Awareness of the public about hydatidosis and tuberculosis should be increased through public education and infected organs should be properly disposed.
- Strong collaboration among governmental organization, nongovernmental organization, veterinarian (researchers) and farmers should be made in order to study on active respiratory disease, to determine the impact of respiratory disease on cattle production and to design control and prevention strategies.

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