



## Meat Safety Inspection in Senegal: Example of the Dakar Slaughterhouse from 2014 to 2018

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**Abstract:** Meat inspection at slaughterhouses is among the most important responsibilities given to the Directorate of Veterinary Services in Senegal. The objective of this 5-year retrospective (2014–2018) study is to give an overview of the main seizure reasons and quantities of red meat (cattle, sheep, and goats) seized in the Dakar slaughterhouse, the biggest facility in the country. Data were collected from annual reports and analyzed using Microsoft Excel, 2019. In total, red meat seizures in this slaughterhouse represented around 0.15% of the total weight of slaughters and are valued at \$123,440 (United States dollars) annually. Tuberculosis, cysticercosis, and putrefaction account for 80% of the weight of cattle carcasses seized. Distomatosis due to *Fasciola gigantica* represented more than 50% of the total weight of cattle organs seized. The very limited contribution of meat inspection to the animal diseases surveillance system, the absence of laboratory investigations to clarify findings, the lack of identification of slaughter animals, and the noncodification of seizure-reason terminology limit the use of available data. Greater attention should be paid to the quality of data recorded at slaughterhouses and to the occurrence and burden of tuberculosis, distomatosis, and cysticercosis so that control strategies can be developed to address them in Senegal.

**Key words:** animal diseases, cattle, goats, meat safety inspection, sheep, slaughterhouse

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## Introduction

In terms of sources of protein in Senegal, fish consumption is estimated at 26 kg per capita per year (Ndiaye, 2014), followed by red meat with 15.8 kg per capita per year (National Agency for Statistics and Demography, 2018). In Senegal, the production of slaughter animals (cattle, sheep, and goats) for red meat is not subject to intensive and/or organized production systems. The transhumant and free-range livestock farming system is still dominant, with no animal traceability and a very limited use of manufactured feeds and veterinary inputs and services to improve the health of slaughter animals and then ensure the quality and safety of red meat. In addition, major transboundary animal and zoonotic diseases are endemic in the country and include anthrax, contagious bovine pleuropneumonia, peste des petits

ruminants (goat plague), foot and mouth disease, and Rift Valley fever (Directorate of Veterinary Services, 2018).

Some of these endemic diseases, including Rift Valley fever and anthrax, increase the risk of unfit meat entering the food chain. Such a context gives the inspection of slaughter animals and fresh meat great importance in the preservation of public health. In Senegal, the veterinary inspection of slaughter animals and their meat is among the key activities performed daily by veterinary doctors and meat-inspector officers working under the responsibility of the Directorate of Veterinary Services. This inspection aim is to verify that meat produced in slaughterhouses is safe and fit for human consumption before it enters the food distribution chain.

However, meat inspection is not adequately performed as stated in the safety regulation provisions

(Decree 89-543, 1989). According to many assessments conducted in Senegal, including the World Organization for Animal Health Performances of Veterinary Services assessment, the practice of veterinary inspection still remains low because of an insufficient number of inspectors to cover needs. In addition to this, the existence of nonconforming slaughterhouse facilities and illegal and uncontrolled slaughters carried out during the frequent religious and social events organized throughout the year are very common. Furthermore, sampling for laboratory analyses to clarify certain findings is rarely performed.

Thus, such a context justifies a review of meat-inspection procedures and findings to assess their performance and propose avenues to improve the delivery of this important mission.

## Materials and Methods

Data were collected from physical annual reports of the Dakar slaughterhouse, provided by the Veterinary Public Health Division of the Directorate of Veterinary Services in the Ministry of Livestock and Animal Production (Veterinary Public Health Division, 2014–2018). This slaughterhouse is the biggest in Senegal. In 2016, on average, 12% of the total annual cattle, sheep, and goats used for red meat produced in Senegal were slaughtered in that facility. Records used were the annual reports of meat seizures at this slaughterhouse from 2014 to 2018. (Veterinary Public Health Division, 2014–2018). A table (Table 1) was utilized to compile data from the reports. Data collected included the type of seizure (carcasses and organs), reasons for seizure, total weight of seizure, total annual weight of carcasses and organs, species

**Table 1.** Data collection table

|                 | Year  |                  |        |
|-----------------|---|------------------|--------|
|                 | Seizure reasons   | Carcasses/organs | Weight |
| Cattle          | Total annual weight of seizures (carcasses and organs) =<br>Total weight of beef produced (carcasses and organs) =                |                  |        |
| Sheep and goats | Seizure reasons   | Carcasses/organs | Weight |
|                 | Total annual weight of seizures (carcasses and organs) =<br>Total weight of sheep and goat meat produced (carcasses and organs) = |                  |        |

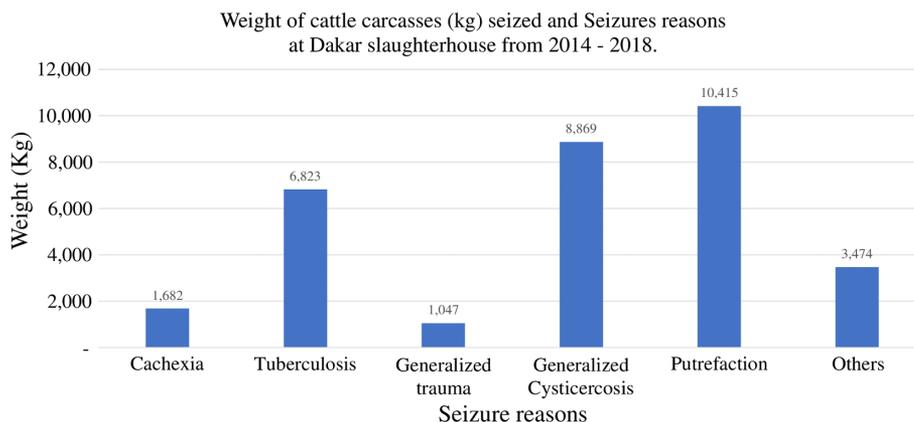
(cattle, sheep, or goats) and dates (per year from 2014 to 2018).

Data were first entered in an Excel spreadsheet, audited for accuracy, and saved using a Macintosh operating system (macOS Catalina, version 10.15.4) with Microsoft Excel 2019 (version 16.35). Data were analyzed and displayed using a line graph (Figure 1) to show the evolution of the weight of beef as well as sheep and goat meat seized from 2014 to 2018. A bar graph was developed to compare the weights of cattle carcasses seized according to the seizure reasons (Figure 2) from 2014 and 2018.

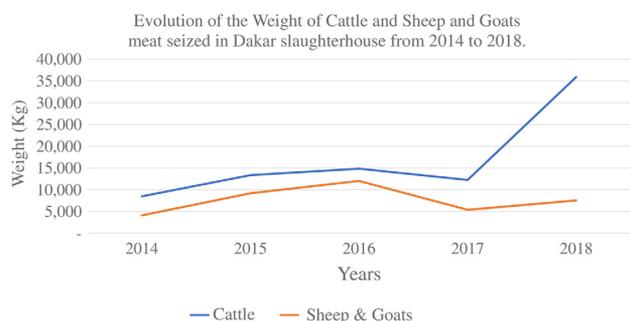
## Results

### Quantities of meat seized

On average, from 2014 to 2018, 17,002 kg of beef and 7,686 kg of sheep and goat meat, both carcasses and organs, were seized annually (Figure 1). Such quantities represent around 0.15% of the total red meat processed annually in that facility (Table 2) and can be



**Figure 1.** Weight of cattle carcasses (kilograms) seized and seizure reasons at the Dakar slaughterhouse from 2014 to 2018.



**Figure 2.** Evolution of the weight of beef as well as sheep and goat meat seized in the Dakar slaughterhouse from 2014 to 2018.

valued at a loss of \$123,441 (United States dollars) per year. During the same period, the average annual red meat production was estimated at 16.5 million kg, valued at \$82,299,252 (US dollars).

### Seizure reasons

The most commonly recorded seizure reasons at the Dakar slaughterhouse are listed in Table 3. Seizure is a decision made by the veterinary inspector to motivate the removal of unfit meat from the food supply chain to reduce the health risks of human consumers. Seizure decisions are made on the entire carcass or on only the organs, according to the types of the lesions observed by the inspector. Veterinary inspectors make decisions based on lesions observed aligned with regulatory provisions (Decree 89-543, 1989). However, various denominations of seizure reasons are recorded, making data use difficult and sometime confusing. In addition, in the records, some data were aggregated, recording just the number of organs or the total weight seized without any other detail. As part of these seizure reasons, listed in Table 3, diseases were reported without any samples collected for laboratory analysis to clarify the findings. It is thus only on the basis of the inspectors' experience and the nature of the lesions observed during inspection that seizure decisions are made.

The most commonly listed diseases for cattle were tuberculosis and cysticercosis (Figure 2). For sheep

**Table 3.** Seizure reasons (by species) commonly recorded at Dakar slaughterhouse from 2014 to 2018

|  | Cattle                    | Sheep and goats           |
|--|---------------------------|---------------------------|
| Carcasses  | Cachexia                  | Cachexia                  |
|  | Icterus                   | Icterus                   |
|  | Putrefaction              | Putrefaction              |
|  | Hemorrhagic congestion    | Hemorrhagic congestion    |
|  | Generalized cysticercosis | Generalized cysticercosis |
|  | Generalized trauma        | Generalized trauma        |
|  | Cadaverous carcass        | Cadaverous carcass        |
|  | Tuberculosis              | Caseous lymphadenitis     |
|  |                           | Sarcoptic mange           |
|  |                           | Abscess                   |
| Organs (liver, lungs, kidney, heart, tongue . . .) | Abscess                   | Abscess                   |
|  | Cysts                     | Cysts                     |
|  | Liver cirrhosis           | Liver cirrhosis           |
|  | Schistosomiasis           | Schistosomiasis           |
|  | Congestion                | Emphysema                 |
|  | Nephritis                 | Bronchitis                |
|  | Distomatosis              | Oesophagostomiasis        |
|  | Hepatic telangiectasia    |                           |

and goats slaughtered, the most commonly listed diseases were schistosomiasis, oesophagostomiasis, sarcoptic mange, and caseous lymphadenitis (Table 3). Distomatosis due to *Fasciola gigantica* represented more than 50% of the total weight for seizures of cattle organs. Among disease conditions, parasitic diseases are the most cited because of the clearly visible lesions they cause compared with other lesions, which can be caused by viral or bacterial infections, requiring further laboratory testing for clarification. Certain lesions and organoleptic conditions observed on the carcasses and organs are also mentioned as reasons for seizure, without any further laboratory investigation to link them to a specific disease condition. These findings include icteric and hemorrhagic carcasses, hepatitis, nephritis, abscess cysts, cachexia, hepatic cirrhosis, and pulmonary emphysema.

### Discussion

The poor quality of data did not make the analysis of seizure reasons easy, especially for seized organs. Various denominations of seizure reasons were recorded for organs for the same lesions, causing

**Table 2.** Total weight and percentage of seizures compared with total weight of meat production (carcasses and organs) by species at Dakar slaughterhouse from 2014 to 2018

|  |                 | 2014          | 2015           | 2016           | 2017           | 2018           |
|--|-----------------|---------------|----------------|----------------|----------------|----------------|
| Total weight (kg) and percentage (%) of seizures | Cattle          | 8,523 (0.09%) | 13,391 (0.13%) | 14,874 (0.14%) | 12,294 (0.11%) | 35,927 (0.31%) |
|  | Sheep and goats | 4,135 (0.11%) | 9,239 (0.16%)  | 12,057 (0.23%) | 5,432 (0.09%)  | 7,569 (0.11%)  |
| Total weight of meat produced (kg)               | Cattle          | 9,808,635     | 10,526,085     | 10,971,572     | 11,230,076     | 11,672,113     |
|  | Sheep and goats | 3,898,693     | 5,841,600      | 5,326,935      | 5,935,043      | 7,088,400      |

confusion and limiting any further correct analysis of data. In addition, some data were already aggregated, recording just the number of organs or the total weight seized without any other detail.

The only exception to consider in this framework relates to cattle carcasses seized; because few seizure reasons were recorded, the compilation of data was made easier. Thus, because of the more significant economic losses associated with the seizure of cattle carcasses, the need for a precise justification is highly necessary. However, there is a need to improve the data-recording system at the Dakar slaughterhouse by codifying the terminology used for seizure reasons.

The main diseases reported for seizure reasons of cattle carcasses were cysticercosis and tuberculosis, which corroborates the findings in Cote d'Ivoire (Diarrassouba, 2011). This is not a surprise given that both Senegal and Cote d'Ivoire are importers of slaughter cattle from Mali and Niger, where similar observations were also reported (for Mali, see Simaga, 2017; for Niger, see Salou, 2016). The widespread nature of these 2 diseases in West Africa is associated with huge losses of proteins and financial resources for populations, suggesting the need to assess their prevalence and develop a regional control strategy.

Although meat inspection at slaughterhouses should fully play an important role in animal disease surveillance, this is not the case, given that no samples are collected for further laboratory analysis to clarify certain inspection findings. However, effective involvement of slaughter animals and meat inspection as part of the national animal disease surveillance system network could contribute to disease detection and help assess the effectiveness of response measures implemented to priority control animal diseases, including contagious bovine pleuropneumonia, peste des petits ruminants, Rift Valley fever, foot and mouth disease, lumpy skin disease, pasteurellosis, and anthrax (Bourzat et al., 2016). However, none of these priority endemic diseases were suspected during inspections carried out in the Dakar slaughterhouse during the period of observation.

## Conclusions

This 5-y retrospective review of meat-inspection data in the Dakar slaughterhouse has permitted showing the main seizure reasons and their economic impact and various limitations, including the weak data-recording system and the noninclusion of meat

inspection in the animal disease surveillance system. Thus, there is need to define adapted surveillance tools in slaughterhouses to better include veterinary meat inspection as part of the animal disease surveillance network system and help trace priority endemic and/or emerging diseases. In addition, tuberculosis, distomatosis, and cysticercosis should be investigated to better understand their epidemiology and then develop regional initiatives to mitigate their public health and economic impacts.

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