



Establishment of manual of procedures for microbial Control of dried meat in chad

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Abstract:

Meat is a high source of protein, which is needed in our diet and contains all the essential amino acids and vitamins A, B12, B6, D and E. In Central Africa, meat consumption is important for the reduction of the malnutrition rate; unfortunately, several outbreaks of foodborne infections have been associated with the consumption of meat. Meat is often processed by drying for longer preservation by the addition spices and sundried. The main objective of this study was to establish a microbial control protocol for dried meat in Chad. This was carried out in the Laboratory of the Biotechnology Center of Yaoundé and the Laboratory of the Institute of Livestock Research for Development of N'Djamena from 02 May 2015 to 15 February 2016. The microbiological analysis was done in according to the criteria of EU regulation, specific standards (EC) N° 1441/2007 on meat. The results of the surveys, the reports and the quality management system of meat enabled us to establish the manual of procedure of microbial control of meat with the proposed easily applied methods. The results showed that 66.25 % of meat sellers were not knowledgeable with good hygiene and processing practices. Only 12.5% of sellers are in clean environment. The *Escherichia coli* record a mean of 3.1 log₁₀ ufc/g of dried meat. The microbial meat control procedure manual established, with proposed easily applied methods, can be used for quality control management of meat.

Keywords: Manual, control protocol, dried meat, N'Djamena.

1 | INTRODUCTION

Meat is a high source of protein which is needed in our diet and contains all the essential amino acids and vitamins A, B12, B6, D and E (Nfor et al., 2014).

Meat consumption is important for the reduction of the malnutrition rate in Central Africa (Chad, Cameroon, Congo and Gabon). However, the average consumption of meat is very heterogeneous from one country to another. Meat

production in Central Africa reached 277,414 tonnes excluding poultry (Faye, 2013). Meat is often processed by drying for longer preservation by the addition spices and sundried. The meats are then sold in fresh or processed forms in Chad (FAO, 2013).

Unfortunately, several outbreaks of foodborne infections have been associated with the consumption of meat.

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Meat has traditionally considered as a vehicle for foodborne diseases in humans. The main objective of this study was to establish a friendly (i.e. easy and sustainable) manual of good practices for microbial control of dried meat (excluding poultry), in Chad, and relevant stakeholders for effective diffusion and field adoption.

2 | METHODOLOGY

The work was carried out in the Laboratory for Public Health Research Biotechnologies and the Food and Drug Safety Laboratory of the Biotechnology Centre of Yaoundé and the Laboratory of the Institute of Livestock Research for Development of N'Djamena from 02 May 2015 to 15 February 2016.

A preliminary survey was conducted at meat vending points (Nurudeen *et al.*, 2014), to evaluate the correlations between the handling conditions and the state of hygiene. A total of 40 vendors of dried meat were surveyed according to ANSSA (2007) and European Union (EU) regulation 853/2004. The microbiological analysis was done in accordance to the criteria of EU regulation, specific standards (EC) N° 1441/2007 on meat. Based on available knowledge, a manual of good practices for microbial control of dried meat has been developed, with easy and sustainable protocols, so we developed a manual of good practices for microbial control of dried meat.

3. RESULTS AND DISCUSSION

The survey's results showed that 66.25 % of dried meat sellers were not knowledgeable with good hygiene and processing practices. The *E. coli* record a mean of 3.1 log₁₀ ufc/g of dried meat and the mean of *Staphylococcus aureus* was 2.1 log₁₀ ufc/g in the analysed samples. Base on available knowledge, a manual of good practices for microbial control of dried meat has been developed, with easy and sustainable protocols.

Table I showed that 42.5% of sellers of dried meat are female. Only 12.5% of these sellers are in clean

environment and 82.5% of sellers don't have protective clothing.

The results of microbiological analysis show the percentage of non-compliant samples. Dried meat samples contain more *E. coli* (70%).

This study showed the results of the survey, the lack in the rules of hygiene and deficits during the technological practices of manipulations in the meat production chain. These data confirm the cases of deficiencies demonstrated by Abdelsalam *et al.*, (2013) in processed meats in Chad and Elhassan *et al.*, (2011) in meats in Sudan. The unclean environment (67%) and the lack of BPH (Bonne Pratique d'Hygiène) and BPF (Bonne Pratique de Fabrication) training (66.25%) could contribute to the contamination of meats by microorganisms as in the case of meat analyzed by Ayalew *et al.*, (2015) in Ethiopia. For the collection samples, it was observed that during the process of drying and preservation by the addition spices, there are some pathogens or high total viable count (Bradeeba and Sivakumar, 2013) and non-compliant samples of meat from N'Djamena. Pathogens were also isolated from meat samples by Fasanmi *et al.* (2010). The presence of pathogens or the non-conformity of the meat samples analysed have been attributed to contamination from waste feces, infected animals or poor hygienic practices during slaughtering, handling, and processing (Diallo *et al.*, 2017; Prince and Maalekuu, 2014).

Dried meat in N'Djamena has been exposed directly to the wind/air that which carries microorganisms. This could explain the high level of microbial contamination of dried meat. The dried meat sellers in Chad are mostly women without protective overall, therefore the high microbial load in the dried meat could also come from the clothes (Firew *et al.*, 2014).The meat quality control management system was carried out by the graphic 1, showing the value chain and the proposals of the methods to be applied to control the microbiological quality of dried meat in Chad. The manual of procedure for the microbial control

Research Review

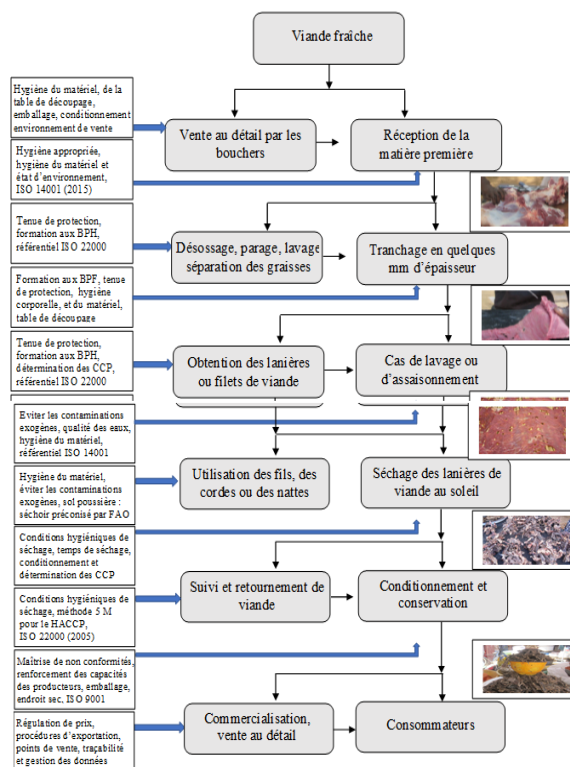
of dried meat, with the easy apply methods; can be used by the scientific community, slaughterhouses, the hygiene services of local communities, the hygiene and sanitation services of communities and the Food Quality Control Centre in Chad.

Table I: Results of the investigation for 40 vending of dried meat.

Dried meat (n=40)	Characteristic	Results (number)	Percentage
Seller's sex	Male	15	37.5 %
	Female	25	62.5 %
Seller's category	Fixed	19	47.5 %
	Semi-Fixed	21	52.5 %
	Ambulant	00	00 %
Environment	Clean	05	12.5 %
	Not very clean	26	65 %
	Dirty	09	22.5 %
In uniform	Blouse	07	17.5 %
	No protective suit	33	82.5 %
training	Training in BPH / PBF	09	22.5 %
	No training	31	77.5 %
Packaging	Plastic packaging	04	10 %
	Paper packaging	30	75 %
	Other	06	15 %

4. ESTABLISHMENT OF MANUAL OF PROCEDURES

GOOD PRACTICES FOR DRIED MEAT



Graphic 1: Value chain and methods to be applied to dried meat



Dried meat from N'Djamena

5. CONCLUSION

The micro-organisms found in meat can cause real public health problems for consumers. This work has proved the authorities to look for ways to tackle this problem. The developed manual of good practices for microbial control of dried meat proposes easy and sustainable protocols for managing microbial risk. Demonstration and effective diffusion and field adoption of the manual will benefit of field work of local NGO (Noodles Chad and Noodles Cameroon) with target users (vendors, producers, breeders, consumers) and stakeholders.

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Research Review

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