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ORIGINAL ARTICLE

CONTAMINATION OF BROILERS BY SALMONELLA NON TYPHI IN MITIDJA

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Abstract: In response to the growing demand of urban populations to animal protein, Algeria is currently involved in the development of the poultry industry around the world watched. Through higher productivity, these modern farms provide the cheapest meat to consumers. But the expansion of production took place without any systematic mastery of hygiene throughout the industry. Research conducted by the authors show that about 9% of chickens sold have unacceptably high rates of microbial contamination, including Salmonella. The birds play an important role as vectors of transmission in human cases of salmonellosis. Evaluation of factors affecting the prevalence and growth of Salmonella on broiler carcasses would be useful to risk managers to identify intervention strategies that would reduce the effectiveness of most human infections. The risks to consumers are increased by the preparation methods in small restaurants, rapidly expanding industry. Hygiene practices are wanting to cooking temperatures is generally too low to kill harmful germs. Solve these health problems is a major challenge to public health and for the poultry industry, if it wants to remain competitive in the context of the expansion of free trade area. Our sampling focused on 25 farms and 10 private slaughterhouses and in summarizing the inspection of Isa Brown birds breed, aged between 50 and 65 days, with a weight of 2.2 to 3.4 kg.

KEYWORDS: Broiler, Salmonella, Nutritional and Organoleptic Qualities, Food Hygiene.

INTRODUCTION

The food sector is one around which crystallize the issues of food security of the population, which has become a major issue for governments, consumers and professional products for human consumption. This password security, in particular, controls of food contamination by pathogenic bacteria. In Algeria, the poultry industry has experienced a notable development since 1980. However, farming practices and slaughter consider as technological lag behind. Indeed, the problem of poultry industry in the health plan is still dependent on farming conditions in general, and especially the hygiene of buildings (Kaci *et al.,* 2008).

Foodborne diseases are a major cause of morbidity and mortality throughout the world in general and Algeria in particular. More than 350 food poisoning cases of listeriosis and salmonellosis are recorded in various health facilities in the last three months in Oran, medical sources say. In the same city, the figures speak for themselves in five years, the number of salmonellosis, the most common diseases, often caused by foods made with eggs, is estimated at 559 in 2005, 103 more than in 2002 . Of this total, there are three deaths (Anonymous, 2005). White *et al.,* (1997) estimated that diarrhea kills 3 million children each year. In the U.S., an estimated 1.4 million people are infected with Salmonella typhi not every year, with 15,000 hospitalizations and 400 deaths (Voetsch *et al.,* 2004), while in France the number is estimated at 30,000 cases of salmonellosis, with 92 to 535 deaths (Espié *et al.,* 2005).

In Denmark, financial losses are estimated between 10.4 and 25.5 million in the year 2001 (Aarestrup *et al.,* 2007). The health aspect is related to the high incidence of foodborne illness collective. They are also the leading cause of gastroenteritis foodborne humans (Anonymous 2002). The objectives of our work are:

- Identify the main characteristics of contamination of poultry farms and slaughterhouses, in assessing the prevalence of these infections in some schools in the province of Blida.
- Specify the resistance to some families of antibiotics and antibiotic resistance patterns define the possible sources of these resistant and potential risk factors leading to contamination with salmonella.

MATERIALS AND METHODS

2.1. Samples and Sampling

Our study involved 25 farms and 10 private slaughterhouses of Blida.

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All samples are taken by the same operator in the same farms and slaughterhouses to another operator.

A pre-established questionnaire collects information on the institutions concerned:

- infrastructure, location, equipment and operation,
- The level of hygiene and staff qualifications,
- The surround and means for cleaning and disinfection,
- Opportunities for access to other animals,
- The origin of water,
- The strains and source of chicks,
- Other questions to the head of the institution must provide an accurate answer for clear answers such as yes / no, numbers or other quantifiable answers.

Two separate campaigns are necessary because of the means which have improved in the second campaign. The samples are accompanied by log sheets, specifying the information necessary for identification, the type and sampling conditions.

2.2. Work Site

Analyses are performed at the Laboratory of Hygiene and Inspection of Food of Animal Origin in the service of the civil hospital in Blida Ferroudja.

2.3. Animal Material

The birds used are Isa Brown breed, exhibiting no signs of illness (diarrhea or other visible signs). They are aged between 50 and 65 days, with a weight of 2.2 to 3.4 kg.

2.4. Bacteriology

Our protocol is based on two reference methods AFNOR (French Standardization Agency), namely NF U47-U47-100 and NF 101 in February 2005, respectively for the isolation and identification of Salmonella serovars in environment and animal production in birds.

Samples are pre-enriched in buffered peptone water 1/10, homogenized for 2 minutes in a stomacher and incubated at 37°C for 16-20 hours.

Two and one milliliters of this broth were used to inoculate 20 milliliters respectively of selenite cystine broth and 10 milliliters of Muller-Kauffmann broth at Tétrathinate-novobiocin (MKTTn), which are then incubated at 37 ° C for 18 to 24 hours.

During the second campaign, Rappaport Vassiliadis Soya broth (RVS) is used, and only 0.1 milliliters of pre-enrichment was inoculated into 10 ml of RVS broth, incubated at 42 ° C for 18-20 h. Thereafter, a petri dish containing agar Hektoen is inoculated and incubated at 37 ° C for 18 to 24 hours.

Boxes without typical colonies of Salmonella are re-incubated for 24 hours, while two to three suspect colonies of Salmonella are then collected and plated on Hektoen agar for purification. The colonies are then confirmed by biochemical tests with the first IST broth (Tri Sugar Iron), then using the API 20 E galleries Laboratory confirmation is performed by slide agglutination with polyvalent serum anti-O Department of Microbiology Boulaid Ben Blida.

2.5. Analyses Statistics

The analysis results are driven by classical statistical methods, with the help of the software Past.

RESULTS AND DISCUSSION

3.1. Questionnaires

The results obtained through the questionnaires used to find and classify the 25 farms and slaughterhouses which 10 samples are collected.

3.1.1 Characteristics of Farms

Farms are classified according to their production capacity, which is an average of 2250 for category 1 and category 2 for 4000, shown in Figure 1.

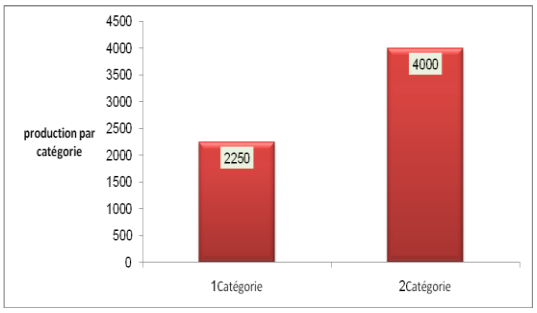

Figure 1: Representation of categories according to their production.

Unlike the second category, the first production is poor, producing four bands of 2250 subjects per year on average. This is due to:

- The density of animals, more than 11 birds per m2, 44% of these farms,
- Using a chopped straw litter: 81% of buildings,
- Construction of mixed structure (solid walls and roof zinc plates): 69% of the buildings,
- Half of them have only one employee,
- 81.2% had no fence,
- 87.5% provide free access to other animals such as cattle, sheep, turkeys, dogs and cats,
- 63% do not consult a veterinarian during the breeding
- The overall health is evaluated visually as very poor in 88% of cases.

The results correspond to those identified by Kaci *et al.*, (2008) for work carried out on 76 farms in the region of Mitidja. Figure 2 summarizes the results noted in Category 1.

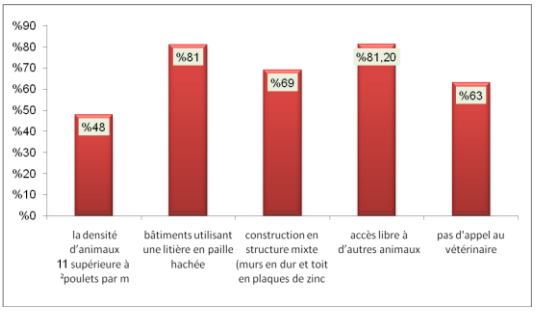

Figure 2: Distribution of results encountered in the category 1 farm.

3.1.2. Characteristics of Slaughterhouses

Slaughterhouses are also classified according to their production capacity in two categories: small slaughterhouses production averaged 1,150 birds slaughtered per day, and abattoirs to large production capacity, an average of 2,000 birds slaughtered per day. Figure 3 shows the categories according to their production slaughterhouses.

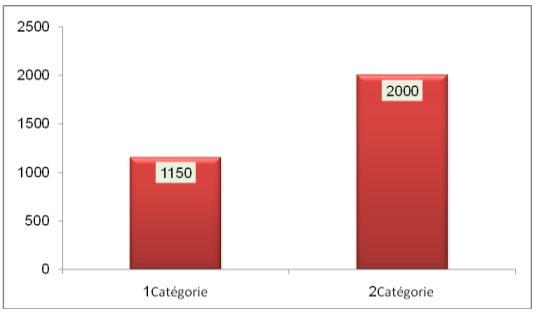

Figure 3: Category of the abattoir as their production.

Category 1 is a small production capacity. Contamination of broilers by Salmonella non typhi in the abattoirs of the study area would be related to several parameters:

- 73.33% of the slaughterhouses are available for dogs and cats,
- 72.7% practicing soak in the open air,
- 63.6% have no functional cold room,
- 63.6% of homes are surrounded,
- 81.8% use water from sources not controlled,
- The overall health is assessed as very poor.

The location of slaughterhouses do not meet the requirements of planning legislation and ignores the environment, wind direction, access roads, wadis or rivers and especially means for discharging the wastewater. The operation is considered chaotic, messy and unhygienic, not respecting the universal rules of operation of slaughterhouses. Indeed, all steps are manual, scalding is not appropriate because the temperature is not controlled, the water is not renewed and outs viscera are very common.

Poultry slaughterhouses, especially in the first category (800 to 1500 individuals per day) are generally very rough conditions with regard to management and the techniques practiced and no standards for slaughter. Unlike the second category (1500 topics and more per day) which has a chain with mechanized operation and practical management techniques and slaughter that are not perfect but respect certain principles and standards of slaughter. Category 1 is a small production capacity. Contamination of broilers by Salmonella non typhi in the abattoirs of the study area would be related to several parameters:

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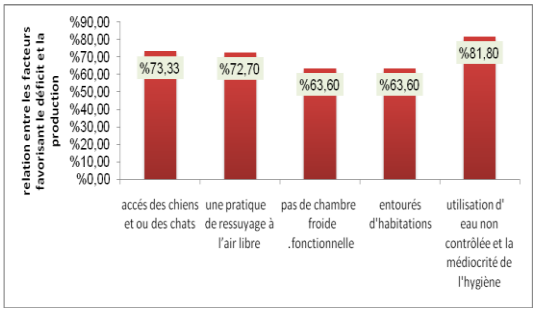

Figure 4: Factors favoring contamination in slaughterhouses

3.2. Resistance to Antibiotics

The results obtained are summarized in Table 1.

Table 1: Antibiotic resistance of Salmonella strains isolated from farms and slaughterhouses in the study areas.

Source	Breeding		abattoirs		Total
Sampling	1200-3000	3000-6000	700-1400	≥1500	
strains tested	20	13	30	3	66
C	0	0	0	0	0
AMC	0	0	0	0	0
CTX	0	0	0	0	0
AM	0	0	0	0	0
CAZ	0	0	0	0	0
CF	0	0	0	0	0
K	0	0	0	0	0
SSS	0	0	0	0	0
CS	0	0	0	0	0
S	6	7	18	0	31
SXT	0	0	0	0	0
OFX	3	2	2	0	7
GM	0	0	0	0	0
TE	3	5	11	0	19
ENR	1	2	5	2	10
Total	13	16	36	5	66

C: Chloramphenicol; AMC: Amoxicillin; CTX: cefotaxime; AM: ampicillin, CAZ: Ceftazidime; FC: Cephalothin; K: kanamycin, SS: Sulfonamides, CS: Colistin; S: streptomycin, SXT: Trimethoprim + sulfamethoxazole; OFX: Ofloxacin; GM: Gentamicin; TE: Tetracycline; ENR: enrofloxacin

3.3. Distribution of Serotypes

The results obtained are summarized in Figure 5.

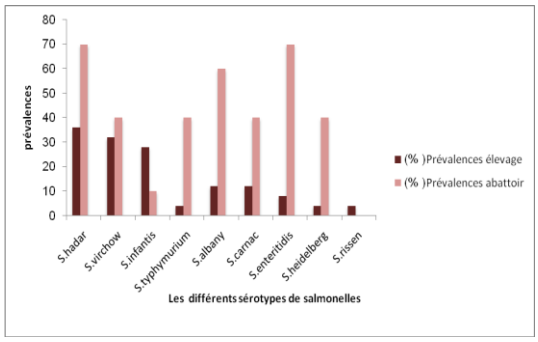

Figure 5: The different serotypes isolated farms and slaughterhouses in the study area.

The relatively high prevalence can be explained by several factors, namely:

- The non-compliance and non-conventional practices of farm management,
- The lack of program monitoring and control of non Typhi Salmonella in hatcheries and private farms, where the most attractive prices are offered to farmers and consumers, with no apparent symptoms of disease.

The results are also explained by environmental conditions, cleaning and disinfection, by unhygienic conditions and unconsciousness of owners and workers vis-à-vis health risks.

The results of isolation of some serotypes and strains are affected very little by assaults experienced by samples during transportation and preservation under refrigerated before being analyzed. These isolation levels can also be affected by the prophylactic use of antibiotics against salmonella or other diseases, which would limit the number of salmonella but not consolidation of farms and therefore reduces the chances of isolating them.

CONCLUSION

From this study, the results allow to make some recommendations:

- Some risk factors associated with Salmonella contamination on farms are identified and justified by the conditions of hygiene. Other more detailed studies are needed to determine all potential risk factors in farms and slaughterhouses, and evaluate retrospectively the remedial effect of these factors.
- The first data on the contamination of the meat industry by salmonella in Algeria show a high prevalence in both livestock slaughterhouse in the study area. This is due to the weak conditions of husbandry and slaughter, but also to errors in management practices and hygiene. This fact is due to several factors, beginning with an action ineffective government control.
- Some players demand the creation of a brigade of Inquiry, whose skills would be expanded to all respect to food security. But the main improvement of the device lies in the constitution, local hubs to food security that will coordinate the work of veterinary inspectors and those of the Directorate General for Competition, Consumption and Fraud.
- Third major cause of the precarious situation: the need for safety, not present at every stage of the food chain, from agriculture to the merchant. Veterinarians and biologists insist on this need for awareness of all stakeholders because of the dramatic consequences that could have any intoxication on the health of consumers.
- S. Hadar, S. Virchow, S. Infantis, S. Albany and S. Enteritidis are the serotypes most frequently isolated. Overall, Salmonella isolates are often resistant to antibiotics, but mainly for old molecules.

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