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Microbiological Evaluation of Artisanal Food Quality and of Good Manufacturing Practice in Agroindustries of the Far West Region of Santa Catarina, Southern Brazil

Eliandra Mirlei Rossi*, Diane Scapin, Monica Lourdes Rosanelli, Jessica Fernanda Barreto Honorato, Larissa Menezes Kochhann

Departamento de Ciências da vida e da Saúde, Universidade do Oeste de Santa Catarina, São Miguel do Oeste, Brasil

Email address:
eliandra_bio@yahoo.com.br (E. M. Rossi)

*Corresponding author

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Abstract: The foodborne diseases are responsible for high economic looses and expressive social problems, which makes the microbiological quality of foods an important aspect of public health. Good Manufacturing Practices (GMP) training courses have been used in order to prevent foodborne diseases. The aim of this study was to evaluate the microbiological quality of artesian food and evaluation of good manufacturing practice in the far west region of Santa Catarina, Brazil. 88 samples of food of animal origin (meat products, fish and fishery products and cattle milk and derivatives) originated and marketed by agroindustries in this region were collected. Microbiological analysis was carried out in accordance with the recommendation and requirement of the RDC 12, from January 2001 and the methodology prescribed by Instruction No. 62, from August 26th, 2003 by the Brazilian Ministry of Agriculture, Livestock and Supply. Afterwards, the evaluation of good manufacturing practice in these establishments was done. Then, the training at the University's Microbiology laboratory was carried out based on practical and theoretical instructions for 8 hours. From the 88 samples analysed, 21 (23.86%) were within the allowed standards established by legislation. Of those, 13 (14.77%) were from meat and meat products (salami, sausage, bacon, black pudding and crackling) and 8 (9.09%) cattle milk products (cheese, pasteurized heavy cream, cream chesse and milk). The fish and fishery products were not contaminated. The most frequent isolated microorganisms were fecal coliforms, which 10 (47.62%) samples had contaminations above the allowed standard, followed by positive *Staphylococcus* coagulase 07 (33.33%) samples, and 4 (19.05%) were contaminated by both microorganisms. *Salmonella* sp., *Listeria monocytogenes* and *Clostridium* suphate-reducers were not isolated in any sample analysed. Good manufacturing practices were evaluated by applying a "check list", elaborated in accordance to the recommendations of the RDC No. 275 Resolution from October 21st, 2002. Through this questionnaire it was shown that 53.65% of agroindustries were appropriated to the legislation, 27.73% were not in accordance and for 18.33% of the industries it was not possible to evaluate, due to not performing the activities described in the "check list". Thus, there is a need to maintain training programs for producers in order to improve the microbiological quality of foods produced by such agroindustries and marketed in the region.

Keywords: Artisanal Food, Contaminated Food, Manipulation, Agroindustries

1. Introduction

Microbiological contamination of food can occur by several factors such as improper handling and storage, cross-contamination between raw and processed products and the use of poorly cleaned utensils and materials [1-2]. Since contaminated food can cause outbreaks of foodborne disease (FBD) to consumers and is a major public health problem [3], they may be caused by various microorganisms, which can enter the human body through the ingestion of

contaminated water and food [4].

According to Costalunga and Tondo [5], few states in Brazil have a surveillance service that organizes the epidemiological data on foodborne illnesses, so only a small proportion of foodborne illnesses are reported to health authorities.

In Brazil, according to data provided by the Health Surveillance Secretary [6], from 2000 to 2017 there were 12.660 reported outbreaks of DTA. It is known, informally, that this number is much higher because most outbreaks are not reported. Currently the southern regions are among the sites with most outbreaks of FBD. The microorganisms that were frequently isolated were *Salmonella* spp., *Staphylococcus aureus*, *Bacillus cereus* and *Escherichia coli*.

The increase in DTA has become a major public health concern, mainly because the epidemiology of these diseases has changed, not only due to the increased susceptibility of humans to DTA, but also by changes in the eating habits of the population [7].

According Zaffari, Mello and Costa [8], in all states of Brazil, artisanal foods are widely consumed, since the population characterized them as natural and tastier than the industrialized products. However, if these products are processed incorrectly they can contain microorganisms that can alter the organoleptic characteristics of food, causing physical and chemical changes in the product, the processes that influences and causes illness to consumers.

The handmade products are manufactured in the vast majority of small family agrobusinesses, where the owners and/or children are the handlers, making this activity a source of extra income for the farm family, so they often fall short in relation to infrastructure facilities, which may compromise the quality of food produced, since these conditions hinder the implementation of Good Manufacturing Practices (GMP) developed appropriated to each activity.

The most susceptible to contamination kinds of food are those with a good nutritional quality, such as proteins, and those with a high water activity, which are crucial factors in the development of microorganisms [3]. Among these foods, we can include animal products such as milk products and meat products. According to data reported by Buyse et al. [9], the most common pathogens associated with milk and milk products are usually *Staphylococcus aureus*, *Salmonella* spp., *Listeria monocytogenes* and *Escherichia coli*. These pathogens can be introduced into the milk and its derivatives in various ways: the udder excretion from infected animals, environmental contamination of the farm and production facilities [10].

Although many foods can serve as sources of foodborne illness, meat and meat products are important causes of human infections with *Salmonella* spp., *Campylobacter jejuni/coli, Yersinia enterocolitica*, VTEC and *Listeria monocytogenes* [11]. According to Fosse, Seegers and Lean [12], enteric pathogens transferred from animals for meat are mainly transmitted from animals without clinical symptoms and thus are not detected by macroscopic tests on carcasses. Bacterial contamination of meat is associated with the transfer through the digestive tract (*Campylobacter*, *C. perfringens*, *S. enterica*, Shiga toxin produced by *E. coli*, *Yersinia enteroliths*) or skin (*S. aureus* and *L. monocytogenes*) of carcass during slaughter [13, 14].

Besides these foods, fish can act as a disseminator of pathogenic potential for humans, such as *Staphylococcus* positive coagulase, *Escherichia coli*, *Salmonella* spp., *Clostridium perfringens*, amongst others. The presence of these microorganisms highlights flaws in some stages of processing or storage of the final product, which can cause serious harm to consumers of these foods [15].

In the Brazil the production of artesian food is the most common, because they are considered by consumers as more natural foods. In state of Santa Catarina, southern region of Brazil it is considered an economic activity, given the large number of agroindustries.

Thus, it is important to conduct these studies because the handlers often lack basic information and as these foods are widely consumed handmade, these actions could assist in maintaining the quality as well as in preventing the spread of DTA and indirectly contributing to the region's economy. Thus, the aim of this study was to evaluate the microbiological quality of craft products marketed in the far west region of Santa Catarina-SC.

2. Materials and Methods

2.1. Samples

88 samples of food of animal origin samples were collected (68 meat products, 4 fish and fishery products and 16 milk and milk derivatives) (Table 1), and marketed by agribusinesses from the far west region of Santa Catarina. The samples were kept in low temperature and immediately conduced to the Microbiological Diagnostic and Research Laboratory at the University of West of Santa Catarina, Brazil, to the procedure of methodological procedures.

Table 1. *Total animal foods analysed.*

	Food analysed	**Number of samples analysed**
Meat products	Ham	02
	Lard	10
	Crackling	08
	Salami	20
	Sausage	10
	Black pudding	06
	Bacon	02
	Frozen chicken cuts	06
	Chicken glibets	02

	Food analysed	Number of samples analysed
	Total	68
	Tilapia fillet	02
Fish and Fishery Products	Carp fish	02
	Total	04
	Cheese	04
	Cream cheese	02
	Butter	02
Cattle and milk derivatives	Pasteurized heavy cream	02
	Pasteurized milk	04
	Craft candy	02
	Total	16
TOTAL		88

2.2. Microbiological Analysis

Microbiological analysis was carried out based on the recommendations and requirements of the RDC 12, from January 2001, since they are marketed variables for each food [16]. The methodology to perform microbiological analysis was based on the Normative Instruction No. 62, from August 26th, 2003, from the Agriculture, Livestock and Supply Ministry (MAPA) [16], which formalizes the official analytical methods used for the microbiological control of animal products and water [17].

The following microbiological analyses were made: Salmonella sp., research of Listeria monocytogenes, fecal coliform count, most probable number (MPN) of fecal coliforms, Staphylococcus coagulase positiva and Clostridium sulphite reducer count.

2.3. Research of Salmonella Sp

For the research of Salmonella sp. 25 ± 0.2g of the sample were added to 225mL of 1% saline peptoned water (DIFCO / France), homogenized for 60 seconds in the stomacher and incubated at 36 ± 1°C for 16 to 20 hours. Later, 1mL was inoculated into a tube containing the sample of tetrathionate broth (Merck / Germany) and selenite cystine broth (Oxoid, England). These samples were incubated at 41 ± 0.5°C for 24-30h. The samples were then streaked separately on Agar Brilliant Green Phenol Red Lactose Sucrose agar (Oxoid / England) and Xylose Lysine Deoxycholate (Merck / Germany) and incubated at 36 ± 1°C for 18-24h. Characteristic colonies were confirmed by biochemical and serological tests [17]. The results were expressed in the presence or absence of Salmonella sp. in 25g or mL of food.

2.4. Research of Listeria Monocytogenes

For analysis of *Listeria monocytogenes,* 25 ± 0.2g of the sample were added to 225mL of LEB broth (DIFCO / France), homogenized for 60 seconds in the stomacher and incubated at 30 ± 1°C for 24 hours. After incubation, 0.1mL was transferred to culture tubes containing 10mL of Fraser broth (AES / Combourg) and 0.1mL of the supplement and incubated at 30 ± 1°C for 24 to 48 hours. After this period, these samples were streaked on Oxford agar (AES / Combourg) and incubated at 30 ± 1°C for 24 to 48h. Characteristic colonies were subjected to Gram staining and biochemical tests [17]. The results were expressed in the presence or absence of *Listeria monocytogenes* in 25g or mL of food.

2.5. Count of Fecal Coliform

For fecal coliform counts 25 ± 0.2g of the sample were added to 225mL of 0.1% saline peptoneted water, homogenized in the stomacher for 60 seconds and the other necessary dilutions were made. The count was performed in triplicate on Violet Red Bile agar (DIFCO, France), using the technique of the pour-plate overlays. The plates were incubated at 36 ± 1°C for 24 hours. Subsequently the plates that contained between 15 and 150 colonies were selected and the typical coliform colonies (pink colonies) and atypical colonies were counted, where it peaked 3 to 5 colonies of each to EC broth (Merck, Germany) and incubated at 45 ± 0.2°C for 48 hours. The results were expressed as CFU/g or ml.

2.6. Determination of Most Probable Number (MNP) of Fecal Coliform

To determine the MPN of coliform organisms the multiple tube fermentation technique was used. For the presumptive test, it was used lauryl sulphate broth (MERCK, Germany) at the following dilutions (1-0.1-0.01mL). The tubes were incubated at 36 ± 1°C for 24-48 hours. For the tubes that were positive (lactose fermentation and gas production in Durham tubes), there was a peaked rate of sodium lauryl sulphate broth in tubes containing EC broth (Merck, Germany). The samples were incubated at 45 ± 0.2°C for 24 to 48 hours. From the combination of numbers corresponding to the tubes that tested positive in each of the tests (presumptive test, confirmatory test for fecal coliform), there was the most probable number according to the MPN table. The value obtained was expressed in MPN/g or mL.

2.7. Count of Staphylococcus Coagulase Positive

For the coagulase-positive Staphylococcus analysis, 25 ± 0.2g of the sample were added to 225mL of 0.1% saline peptoneted water and homogenized in a stomacher for 60 seconds. From this dilution other necessary dilutions were made. The coagulase-positive Staphylococcus analysis was performed in triplicate, where 100uL of sample were streaked on Baird-Parker agar (DIFCO / France) and the plates were

incubated at 36 ± 1°C for 30 to 48 hours. Plates containing between 15 and 150 colonies and counted typical colonies (black surrounded by a bright light halo) and atypical colonies (greyish or black without halo) were selecteed, and 3 to 5 colonies of each plate was used to inoculate Infused Brain Heart broth (Oxoid, England) and Infused Brain Heart agar (Oxoid, England) and incubated at 36 ± 1°C for 48 hours. The identification of strains was realized by the coagulase reaction and catalase [17].

2.8. Counting Clostridum Sulphite Reducer

To count *Clostridium* sulphite reducer, 25 ± 0.2g of the sample were added to 225mL of 0.1% saline peptoneted water and homogenized in a stomacher for 60 seconds. From this dilution other necessary dilutions were made. The count was performed in triplicate Sulfite Polymyxin Sulfadiazine agar (DIFCO, France) using the pour-plate overlays technique and the plates were incubated anaerobically at 36 ± 1°C for 24 hours. Characteristic colonies were counted (black colonies) and confirmed by Gram staining and specific biochemical tests [17].

2.9. Training and Evaluation of Good Manufacturing Practice

Good manufacturing practices were evaluated by applying a "check list" created in accordance to the recommendations of the RDC No. 275 Resolution [18]. The handler participants were offered a course highlighting good manufacturing practices. The course consisted of lectures, expository activities and discursive practices in the University of the West of Santa Catarina's Microbiological Diagnostic and Research Laboratory in the city of São Miguel do Oeste, Brazil.

3. Results

Of the 88 samples analyzed, 21 (23.86%) were in accordance to the standards allowed by the RDC 12, from January 2001. Of these, 13 (14.77%) were derived from meat and meat products (salami, sausage, black pudding, bacon, coppa and crackling) and 8 (9.09%) cattle milk and milk products (cheese, pasteurized heavy cream, cream cheese and milk). The fish and fishery products were not contaminated.

The most frequently isolated microorganisms were fecal coliform. In other words 10 (47.62%) samples were contaminated above the allowed standards, followed by *S.* positive coagulase with 7 (33.33%) contaminated samples, and 4 (19.05%) of the samples contaminated by both microorganisms. *Salmonella* sp., *L. monocytogenes* and *Clostridium* sulphite reductor were not isolated in any of the analyzed samples.

From the 68 meat products samples, 13 (19.11%) were outside the legal standards. The most contaminated foods were sausages: salami (46.15%), sausage (15.38%) and black pudding (15.38%). The microorganisms isolated from samples of meat products analyzed were: *Staphylococcus* positive coagulase 9 samples (69.23%) and fecal coliform 6 samples (46.15%). Of these, two (15.38%) samples were contaminated by *Staphylococcus* coagulase positive as well as by fecal coliform. The enumeration of *Staphylococcus* coagulase positive ranged from 3.5×10^3 to 1×10^8CFU/g, with an average of 1.1×10^7CFU/g, and fecal coliform ranged from 1.6×10^3 to 1.7×10^5CFU/g, with an average of 4.1×10^4CFU/g (Table 2).

Table 2. *Samples determined to be outside the permissible standards.*

	Food analyzed	Results	
		Coliforms (CFU/g or mL)	*S. aureus* (CFU/g or mL)
Meat products	Salami	1.9×10^4	-
	Salami	1.6×10^3	3.7×10^4
	Salami	1.7×10^5	-
	Salami	3.6×10^3	-
	Salami	-	1.6×10^6
	Salami	-	1.8×10^4
	Sausage	1.5×10^4	-
	Sausage	4×10^4	1.1×10^4
	Black pudding	-	1.1×10^4
	Black pudding	-	3.5×10^3
	Coppa	-	1×10^8
	Crackling	-	1.2×10^4
	Bacon	-	1.9×10^4
Fish and Fishery Products	Cheese	5.8×10^6	1.5×10^3
	Cheese	4.7×10^7	-
	Cheese	3.9×10^3	-
	Pasteurized heavy cream	MNP>110	-
	Pasteurized heavy cream	MNP >110	550
	Pasteurized milk	MNP 9.3/mL	-
	Pasteurized milk	MNP >110/mL	-
	Cream cheese	MNP 110/mL	-

The milk samples were derived from bovine animals and those that were most contaminated by fecal coliforms. From the 16 samples analyzed, 8 (50%) were contaminated by this kind of organism. The most contaminated foods were: craft

cheese (37.5%), pasteurized milk (25%) and heavy cream (25%). The number of coliforms ranged from 9.3MPN/mL to 4.7×10^7CFU/mL or g and an average of 6.6×10^6CFU/g or mL of food examined.

Verification of Good Manufacturing Practices was performed by using the "check list", which is divided into five sections, as described in Table 3, classified as poor (0-50%), good (51% to 75%) and excellent (76 to 100%).

Table 3. *Results of the items assessed in the "checklist".*

ITEMS ASSESSENT	YES*	NO*	NA (not rated)
01 - Building and installation	53.98%	38.02%	6.69%
02 - Equipment, furniture and appliances	66.66%	33.33%	0%
03 - Handlers	73.80%	26.19%	0%
04 – Food production and transportation	66.66%	31.98%	1.34%
05 - Documentation	7.18%	9.15%	83.66%
TOTAL (average)	53.65%	27.73%	18.33%

* Adequate according to the legislation; ** Not adequate according to the legislation.

Of the items evaluated, 53.65% were in accordance to the legislation, 27.73% were in nonconformity and for 18.33% of the samples it was not possible to assess, due to not performing the activity described in the "check list".

The most fit item, with 73.80% compliance was the the one for food handlers, involving personal hygiene, health, personal protective equipment, and appropriated training periods - in other words, good manufacturing practices adopted by the handlers in search of greater food safety.

According to the questionnaire, the less fit item was the documentation, which evaluates the performance of activities in the agro-industry in accordance with the GMP Manual. In the agribusinesses that the questionnaire was applied, only one had the GMP Manual. However, procedures described there are performed differently than the document predetermined.

In training, the handlers were informed about legislation addressing food issues, GMP and food contamination. With that, it was possible to demonstrate that, in addition to raw ingredients, handlers and the work environment can contain microorganisms that can later be transferred to the food, thus contaminating it.

Taking into account the problems reported during the course of the classes, it was noted that most handlers and owners lack basic information, such as indicating the presence of specific microorganisms in the product, the sources of contamination, as well as the possibility of cross-contamination. This demonstrates the lack of qualified professionals to perform these tasks, and the lack of appropriated physical infrastructure for safe food production.

4. Discussion

The number of samples that were at odds with the allowed standards was 21 (23.86%), which is lower than the results found by Aragon-Alegro et al. [19], who analysed 172 samples of food (milk, cheese, ice cream, yogurt, sweet and savoury) and found that 69 (40.1%) were at odds with the allowed standards. Of these, 15 samples (8.7%) exceeded the number of fecal coliform and *Staphylococcus* positive coagulase and 54 (31.4%) of the samples had counts outside the standards for fecal coliform. The prevalence of the microorganisms identified was similar to that found in this study - 10 (47.62%) samples were higher than the standards for fecal coliform, 7 (33.33%) for *S.* positive coagulase and 4 (19.05%) of the samples were contaminated by both microorganisms.

In the study realized by Normano et al. [20], which evaluated the presence of *S. aureus* and enterotoxins produced by this microorganism in meat and dairy products, it was noted that 12.8% were contaminated with *S. aureus*, with a higher prevalence in dairy products (17%), and 10% of meat and meat products were contaminated by this microorganism. These results differ from the ones in this study, because the meat products were the ones that were most contaminated with *S.* coagulase positive (69.23%), as well as bovine milk and derivatives (25%).

The found results are worrying because they highlight the potential risk to meat and dairy products consumers, since *Staphylococcus aureus* is the second most common cause of foodborne illness [6], and, when in high numbers, it can produce enterotoxins, which sometimes can cause illnesses to consumers due to ingestion of preformed enterotoxins produced in food [19].

The high amount of fecal coliform found is also worrying, because the presence of these microorganisms in foods indicates inadequate sanitary conditions during processing, since it comes from humans and animals intestines [21]. *E. coli* is the main representative of this group and is used directly or indirectly as an indicator of fecal contamination in food, besides indicating the possible presence of enteric pathogens [22], which may lead to various gastrointestinal diseases in consumers of these kind of foods [23].

The absence of *L. monocytogenes*, *Salmonella* sp. and *Clostridium* sulphite reductor in the analyzed samples is important, because these organisms are serious pathogens that may be found in foods and that cause DTA to consumers. Although our study did not find these microorganisms, other studies reveal that these pathogens may be present in these foods [22, 24, 3].

In relation to meat products, it can be seen that the samples were more contaminated in embedded products: salami, sausage and black pudding, accounting for 76.91% of the samples. The microorganisms isolated were fecal coliform and *Staphylococcus* positive coagulase, confirming the results obtained by Salvatori, Bessa and Cardoso [25], who

analysed 93 samples of sausages and found that none of the samples had *Salmonella* sp. However, five samples of fresh pork sausage (raw sausages and similars), were in poor sanitary conditions for having fecal coliform above the allowed standards.

The results found in this study are not surprising, since they are similar to others conducted in the region, such as by Magnani et al. [26], who found that 84% of colonial salami was contaminated with *Escherichia coli* and, of those, 72% were outside the standards allowed by legislation and unfit for human consumption. We can also mention the Senter, Sardiglia and Rossi's sutdy [27], who analysed 30 samples of such colonial salami and found that 43.3% (13) of the samples were contaminated by fecal coliform. Rhoden et al. [28], who examined colonial salami collected in the extreme west of Santa Catarina, observed that 87.5% of the samples were outside the permissible standards legislated for *S.* positive coagulase, with an average of 6.7×10^7CFU/g.

The contamination found in sausages corroborates other studies, for example, Ferraz et al. [29], who found 80% of unfit for human consumption black sausage because of contamination by *Staphylococcus* positive coagulase.

According to Welker et al. [3], meat products are often associated to DTA outbreaks, since they are an excellent microbial growth base, due to the variety of nutrients, high water activity and low acidity. Thus, the results found in this study are of concern to public health, especially because sausage and salami are often consumed by the population and usually in natura, that is, the consumer usually eats these food items without putting it through any thermal treatment, which increases the risk of DTA occurrences.

The high contamination of milk and milk derivatives found in this study, where from 16 samples 8 (50%) weren't in accordance with the standards, confirms the data found by Aragon-Alegro et al. [19], who analysed 20 samples of cheese and milk and found that 16 (80%) were not in accordance with the legislation. According to Nero [30], most cheese and milk samples were not in accordance with the standards, because in Brazil these foods are produced with low technology, and lack of sanitary control for the animals and cleaning equipment which are factors that contribute to low quality milk and cheese.

The fecal coliform contamination in the samples of milk and milk products indicates fecal contamination, which may have occurred during processing and storage, and indicates the likely presence of other pathogens [21].

The results of the study for these products are a concern for consumers because these foods are widely marketed in the region and are usually eaten raw. It is also necessary to emphasize that all these foods undergo heat treatment, which drastically reduces the amount of microorganisms, so the contamination found represents failures in the manufacturing process.

The fish and fishery products were not contaminated. These results are similar to those found by Ribeiro et al. [15], who analysed 62 samples of frozen fish in Rio de Janeiro, and all samples had counts of *S.* coagulase positive below 100 colony units and absence of *Salmonella* sp., and this is within the microbiological standards established by the 12 Resolution from February 1st, 2001, from National Agency for Sanitary Vigilance.

The family agribusinesses have been characterized as an important source of sustainable development for small farmers [31], and from the questionnaire used in this study, it's possible to conclude that there is a need to implement permanent qualification and monitoring programs for agro-industries, as it is noticed that, in most cases, the microbiological quality is not a priority, which often can result in public health problems.

According to Neto et al. [32], the lack of techniques engaged in the agro-extension activity and the difficulty of obtaining technical and operational information contained in the recommendations of Good Manufacturing Practices by food processors, especially for small agribusinesses, are factors that contribute to several cases of non-compliance in routine work performed by the Health Surveillance, and these non-conformities may be causing foodborne infection to consumers.

Thus, the adoption of quality assurance systems are essential for obtaining products with assured quality. GMP are important for the safety of food produced, however, are sometimes difficult to apply in agro-industries, mainly because these industries have a weak structure, which hinders its correct fit. A study by Cruz [33] highlights the difficulty for GMP implementation in agro-industries, as some establishments had poor working conditions, endangering the health of food handlers. The RDC 275 resolution [18] establishes various procedures on good manufacturing practices for food producers to ensure hygienic conditions and that sanitary food is produced.

These agribusinesses that process animal foods are inspected by the Agriculture, Livestock and Supply Ministry, the State Departments of Agriculture and the Municipal Agriculture inspection through the Federal Inspection Services (SIF), State (SIE) and municipal (SIM). These departments are responsible for authorizing the marketing of such products in certain places. SIF controls the commercialization in the country and abroad, SIE and SIM in the state in the municipality [31]. Agribusinesses are analyzed only by SIM, so hygienic and sanitary control is strict. A program that is being deployed in the far west region of Santa Catarina is the National Health Care for Agricultural Health (SUASA), which aims to provide the marketing of industrial products by agribusinesses throughout the Brazilian territory, in which the SUASA conducts regular monitoring of the activities in such establishments in order to ensure the quality of food produced.

5. Conclusion

The results showed that 23.86% of the samples were unfit for human consumption, and meat products and cattle milk and derivatives were those with the highest contamination, showing high counts of fecal coliform and S*taphylococcus*

positive coagulase. This demonstrates the lack of a more effective control of raw materials, food handlers, and processing of the product in the final stage, as these results indicate poor sanitary-hygienic conditions in the manufacturing of these foods. Regarding the results of questionnaires and the analysis conducted, the lack of concern of most owners and handlers of the safety of food produced became apparent. The craft food produced by agribusiness is an option to increase the income of many producers, but often the microbiological quality is not a concern, but something that goes unnoticed by those handlers; a worrying fact, because even if the food apparently presents normal appearance, it may contain bacteria that cause DTA to consumers.

Thus, there is a need to maintain training programs for these producers in order to improve the microbiological quality of food produced and marketed for these agricultural industries, particularly those establishments that want to participate in the SUASA.

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