

PAPER • OPEN ACCESS

BPM analysis and security case study: dining rooms Cartagena military, Colombia.

To cite this article: E Polo-Carrillo *et al* 2019 *IOP Conf. Ser.: Mater. Sci. Eng.* **519** 012005

View the [article online](#) for updates and enhancements.

BPM analysis and security case study: dining rooms Cartagena military, Colombia.

E Polo-Carrillo¹, Y Cabarcas-Ariza¹, C A Marrugo-Arnedo^{2,3}

¹Fundación Tecnológica Antonio de Arévalo.

²Grupo de Investigación Fundovida. Fundovida IPS.

³Grupo de Investigación en Economía de la Salud (GIES) – Universidad de Cartagena.

emilia.polo@tecnar.edu.co

Abstract. Foodborne diseases constitute an important public health and productivity problem for companies, since it increases the level of employee absenteeism and decreases productivity. Objective, analyse the conditions of good practices of manufacturing and security in the dining rooms of a military complex located in the City of Cartagena, Colombia. Descriptive study based on the application of a standardized instrument in six dining rooms of a military complex located in Cartagena. Analysing 164 aspects contained in Resolution 2674 of 2013, it was possible to observe total compliance in 58 aspects, for its part, 36 partially comply and finally, 70 aspects do not comply with the provisions of the legislation. It is necessary to consider that the implementation of good manufacturing practices is constituted as the primary instrument for the adequate handling of food. The study is the basis for the implementation of internal policies aimed at improving good practices in manufacturing and security in the dining halls of the military complex.

1. Introduction

Foodborne diseases (ETA) are an important public health problem due to the increase in their occurrence, the emergence of new forms of transmission, the emergence of vulnerable population groups, the increase in the resistance of pathogens to antimicrobial compounds, Inter alia. The incidence of these diseases is a direct indicator of the hygienic-sanitary quality of food, and it has been shown that contamination of these can occur during processing or by the use of contaminated raw materials, since some bacteria pathogenic for man form part of the normal flora of birds, pigs and cattle [1-5].

According to Yunesky (2012) [2], the safety is one of the elements that together with the nutritional, organoleptic and commercial characteristics make up the quality of the food; this has been defined by the Codex Alimentarius as the guarantee that the food will not cause harm to the consumer when it is prepared and / or when consumed, according to the use to which it is destined. In that sense, the health and life of people depend in large part on the nutritional quality of the food they consume daily, which in turn depends on the hygienic and sanitary quality to which they are subjected throughout the production chain, from the field to the consumer's table [6-9].

Although the lack of hygiene and sanitation in the processing and preparation of food is a problem that can occur anywhere in the world [10-12], the incidence of diseases caused by poorly processed or poorly prepared foods is a critical, severe problem that is found more frequently in developing countries, according to global disease burden statistics, in In 2015, one in ten people get sick every year when they



eat contaminated food and 420,000 die as a result of these diseases. Children under 5 are particularly at risk and 125,000 children die every year from foodborne diseases [13].

The regions of Africa and South-East Asia of WHO have the highest burden of foodborne diseases. Almost one third (30%) of all deaths from foodborne diseases occur in children under 5 years old, despite the fact that children of that age represent only 9% of the world population [13].

In Colombia, for the year 2010 there were approximately 11,589 cases of foodborne diseases, in the following years the behavior in the notification was the increase, 2011 (13,961 cases), 2012 (11,836 cases), 2013 (9,326 cases) and in 2014 (11,425 cases). As of 2015, 10,243 cases of ETA were reported in 162 outbreaks.

Up to the thirteenth epidemiological period of 2016, Sivigila was notified of 9,781 cases of ETA, involved in 679 outbreaks. Of the total of cases notified to epidemiological week 52 of 2016, 51.3% of the cases of foodborne diseases were registered in the male sex; 21.2% of the cases were registered in the group of 10 to 14 years [13].

Empirical studies affirm that outbreaks transmitted by food have important economic repercussions for companies [3, 14]. It is important to mention that, of every ten medical disabilities reported by the military personnel on board the complex and civilians on the payroll, six correspond to infections caused by poor food handling, which produces high rates of absenteeism and decrease in the labor productivity of the workers.

In this order of ideas, the objective of the present investigation is to analyze the conditions of good practices of manufacturing and security in the dining rooms of a military complex located in the City of Cartagena de Indias, Colombia.

2. Materials and methods

A descriptive investigation was developed, with the objective of characterizing the conditions of Good Manufacturing Practices (GMP) and safety within the dining rooms, taking as reference Resolution 2674 of 2013.

2.1. Collection of information

For data collection, the direct observation technique was used, where the conditions of the dining rooms and Good Manufacturing Practices (GMP) were rigorously inspected for 8 months (July 2017 - February 2018).

A standardized form (sanitary inspection certificate to food factories) of the National Institute for Drug Monitoring (INVIMA) was used as a measuring instrument. Based on Resolution 2674 of 2013, it provided the parameters of compliance with the regulations for the food industry. food which are (conditions of buildings and facilities, equipment and utensils, personal manipulator, hygiene and manufacturing requirements, quality control and safety, training plans, among others).

The product qualification of the application of the standardized form on compliance scale takes values from one to five, where one (1) is equivalent to non-compliance, three (3) is equivalent to partial compliance and five (5) to total compliance.

2.2. Sample

6 dining rooms of the Cartagena military complex D.T.H Colombia were inspected.

3. Results and Discussion

In Table 1, it is important to highlight that the hygiene and safety conditions of the buildings and facilities are well constructed given that they have enough space to carry out the work and for the circulation of personnel, however a negative aspect is the non-compliance of the standards of good practices: There is no physical separation between areas nor a logical sequence between them which shows that the facilities are designed in such a way that they do not facilitate cleaning and disinfection work since a large percentage of the processing areas do not. They have good hygiene and sanitation conditions

Table 1. Conditions of hygiene and security

Manufacturing practices	Sanitary requirements	Resolution 2674 of 2013	Score
BUILDING AND INSTALLATIONS	Localization and access, supply of water, health services, disposition of waste, methods of cleaning and disinfection.	Act. 6	3
	Floors and drains: pipes.	Act. 7	1
	Sanitation: programs and procedures.	Act. 26	3
	Protection control.	Act. 26, Act. 28	3
	Conditions of processes and manufacturing: design, construction, adaptation, cleaning and lighting and ventilation.	Act. 7	3
EQUIPMENT AND UTENSILS	Design, construction, adaptation, cleaning and disinfection. Prevention of cross contamination.	Act. 9	3
HYGIENIC MANUFACTURING REQUIREMENTS	Raw materials / supplies: cleaning, storage conditions, conservation. Prevention and cross contamination.	Act. 16, Act. 20, Act. 28	3
MANUFACTURING OPERATIONS	Safety assurance: duly established procedures, PCC, Ph, Aw, among others. Packaging and packaging: characteristics-labeled	Act. 19.	3
ASSURANCE AND QUALITY CONTROL	Control systems, technical sheets.	Act. 22, Act. 16	1

The canteens have enough drinking water reserve, however, one of them does not have a structure that facilitates washing and cleaning, in addition to this, the lid of this facilitates the entry of insects, pests and animals. Due to the aging of these storage tanks they present surfaces that generate toxic pollutants, the covers are not hermetic and none of them have identification as required by the norm.

The management of liquid waste in the dining rooms is not carried out under quality parameters that prevent contamination of the food, the sanitary facilities of the kitchens are not suitable for use, given that the bathrooms are not in optimal operating conditions, they remain clean, they do not have the minimum resources required for personal hygiene, there is no signage. The chemical products for disinfection are found in places that promote cross-contamination, there are no hand soaps and towels for cleaning and drying. The utensils are cleaned and disinfected properly but it is not enough because most of them have cracks and glue stuck to their surface, with bumps and bruises that make proper disinfection impossible.

Similarly, solid waste that there is no order and cleanliness inside the kitchens and that in practice there is no collection system within the kitchen in an orderly manner of solid waste, there is no separation at source and waste in Most of them are deposited in a single tank / tank, and are not removed frequently to avoid contamination. It should be noted that there are cold rooms of organic waste easily decomposed, however, are not used for that purpose.

The control of pests (arthropods, rodents, birds) in each building have official contracting for pest control in full compliance with the legislation applied in this BPM and safety analysis; However, in total contrary to the standards allowed in said legislation, it was found that the kitchens do not have barriers, screens and other devices allowing the free passage of pests, insects and rodents, which makes it common to see the entry of animals into the area. Kitchen is worth mentioning that good practices go hand in hand with cleaning and disinfection, the analysis showed that they do not have ecological points

and inside the kitchens there is no separation of waste, even basically: liquids and solids. The cleaning and disinfection procedures do not satisfy the particular needs of the process and the final product.

Consequently, the cleaning, cleaning and disinfection of areas, the conditions of process and manufacturing have great importance to prevent incidents and accidents of work, in this aspect the characteristics of floors walls and drainages are a fundamental aspect, product of this analysis could be establish that the floors are mostly worn and greased with cracks allowing pollutants to be generated, the walls specifically at the junction with the roof, most do not notice the original color they are painted because they look dark accumulated dirt, between walls and floors are holes where dirt accumulates. The ceilings of kitchens and dining rooms are not built with materials that facilitate cleaning and disinfection. In one of the audited kitchens, roof failures were observed.

The windows are dirty and neglected there are no barriers between insects, pests, with the kitchen, wooden doors are mostly worn and do not have automatic closing devices and tight fitting.

A positive aspect that could be determined at a glance are the conditions of the stairs, elevators and complementary structures are located and built strategically, allowing the mobility of personnel and not generate, or cause pollution. Electrical, mechanical and fire prevention installations must be properly designed and marked; in the same way it happens with the lighting conditions because it is sufficient for the tasks.

The ventilation of the buildings has openings for air circulation, however these are not protected with anti-insect nets of non-corrosive material which easily allows the passage and housing of animals. The extractor hood of one of the dining rooms that is used for the evacuation of air, is dirty and rusty.

On the other hand, the equipment and utensils that predominate in the kitchens are: kettle, stoves, extractor hood, blender, oven, blender, spoons, knives, ladles, pots, pans, plates, chopping boards, plates, glasses, scales, drawers, silversmiths, bain marie, trays, coffee makers, auxiliary cart, quadrants, drawers, industrial blender, juicers, industrial juicer, freezers, fridges, fryers, coolers, pans, strainers, centrifuges, skimmers, spatulas, corkscrews, forks, peelers, mortars, scissors, tweezers, can opener and funnel. Most are not designed for easy cleaning and disinfection, their surfaces do not allow it. In general terms the kitchen area mostly surfaces have cracks, porosities and defects for deposit of microorganisms.

As regards hygienic manufacturing requirements, raw materials and supplies are included, as well as manufacturing, preparation, processing, packaging and storage activities that comply with the requirements to guarantee food safety. As there is a site for the storage of raw materials and finished products, however, there is no adequate technique of conservation and control of frozen products, the storage of raw materials for food in relation to food preservation that is of great importance in Regarding compliance with the current regulations that guarantee food safety are conservation techniques, in this type of establishments is adequately met, the existence of cold rooms is highlighted, but these do not have temperature measurement instruments and do not have the conditions of order and cleanliness for its use.

An equivalent compliance with good manufacturing practices "BPM" is the assurance and control of quality and safety in terms of control systems and laboratory; the controls carried out on the different products and receipt of the raw materials are carried out in an appropriate manner. However, there are no manuals, guides, procedures or any type of documented indications for equipment or rooms. As far as the Laboratory is concerned, there are no manuals and procedures, nor is there a verifiable system for analysis of critical points or critical stages (conservation-cold room). The cold room and other equipment do not have a maintenance plan, they are repaired only when they are damaged, and they do not have qualified personnel in charge of the training program.

Table 2. Conditions of hygiene and personal safety manipulator

Personal manufacturing practices manipulator	Sanitary requirements	Resolution 2674 of 2013	Score
Health status	physical	Act. 11	3
Education	Training plan of BPM	Act. 1, Act. 13	1
Protection elements	Protection elements	Act. 14	3
Habits	Uniform, Hand washing	Act. 14	3
Visiting staff	Safe hygiene practices	Act. 13	1

Discrimination of the variables analyzed in the inspections shown in Table 2, hygienic conditions and personal safety manipulating hygienic practices and protection measures, in the analysis was determining this aspect being a critical factor in terms of good manufacturing practices that can alter the quality of the food handled and that is a generator of pathogenic microorganisms that cause diseases and toxi-alimentary infections; it could be established that there is hiring to perform medical examinations, however, after an absence due to infection there are no follow-up examinations, there is not in all cases a certificate that shows the suitability for food handling, there are no adequate points for disinfection, protocols for conservation are not always implemented. It was observed that not all have mesh or cap, as is also notorious the use of disposable face masks covering nose and mouth while handling food, the use of different accessories, it is common to observe people consuming food within the handling area.

It is observed that the visiting staff has easy access to the food preparation area, that this area is not restricted and is very easy to contaminate since the personnel that enter does not have elements of protection, before, on the contrary, some They arrive with dirty coveralls and go directly into the kitchen.

In the same sense, it could be established that in terms of education and training, the military complex does not have a training plan for the kitchen and dining room staff, therefore, there is no timetable that evidences the execution of these trainings. Not all food court officials are required to certify the fitness for food handling, likewise there are no good handling habits by the manipulative staff and it is very easy to see the staff come out and enter again with the robe with which they manipulate in the kitchen, non-existent controls on the entry of unauthorized personnel into food handling areas, with coveralls working in other activities and without protection elements. Good habits do not predominate, some due to lack of training or because the conditions of adequacy do not facilitate them, such as not having easy access, such as washing hands when leaving the bathroom since they do not have special sinks for this and must be done in the bathrooms. kitchen dishwashers provided for other work, the same happens with hand drying towels that are absent in this process.

In general, it was possible to detail several security flaws in all the facilities of the dining rooms, they are the relevant aspects that are part of the culture of every organization, ensuring the welfare and integrity of the officials and visitors. In Table 3, 24 aspects of general security of the establishments are audited and it can be detailed that only 10 of these are in total compliance with an estimate of 5.

To conclude, the present study demonstrates that in an analysis of 164 aspects contained in Resolution 2674 of 2013, it was possible to observe total compliance in 58 aspects, meanwhile, 36 partially comply and finally, 70 aspects do not comply with that established by the legislation in the dining rooms of a military complex located in the city of Cartagena of Indias.

The canteens in a generalized way have the same characteristics since all are characterized by their work under the same conditions, it is important to bear in mind that these analyzes were carried out based on the Colombian legislation, law 9 of 1979, better known as the sanitary code, the decree 3075 of 1997 whose complement is resolution 2674 of 2013.

Table 3. Synthesis of security aspects

General aspects of establishment	Score
Conditions of permanent order and cleanliness and clearly defined procedures	1
Floor free of objects at all times, constructed in such a way as to avoid the stagnation of liquids and other substances	1
Order with objects, materials and elements.	1
Work surfaces are free of unevenness	1
Classification of materials present in the work area (necessary and unnecessary)	1
There is an easy-to-use medicine cabinet in the restaurant area	5
Ecological points for adequate separation of waste	1
Areas of work and storage are not properly demarcated or marked	1
Means of notice to restrict access by personnel outside certain restricted work areas	1
Warning signs indicating the risks present in the work areas	1
Internal dimensions surface extension and capacity, are suitable for equipment placement	5
Preventive maintenance of equipment and other tools	1
Appropriate tools in such a way that they do not represent a danger to workers	5
Visitors are prohibited from freely accessing the food preparation areas	1
Visiting staff entering the preparation area do so with protection elements	1
It has security regulations displayed in a visible place for the food area	1
Electrical installations visibly in good condition and all electrical circuits signalized	5
The exposed electrical installations are protected against impacts	5
It has electrical insulation (pole to ground)	5
For fire prevention there is water, extinguishing devices	5
For fire prevention there are trained personnel	5
There are enough exit routes	5
Extinguishers with valid recharge date	5

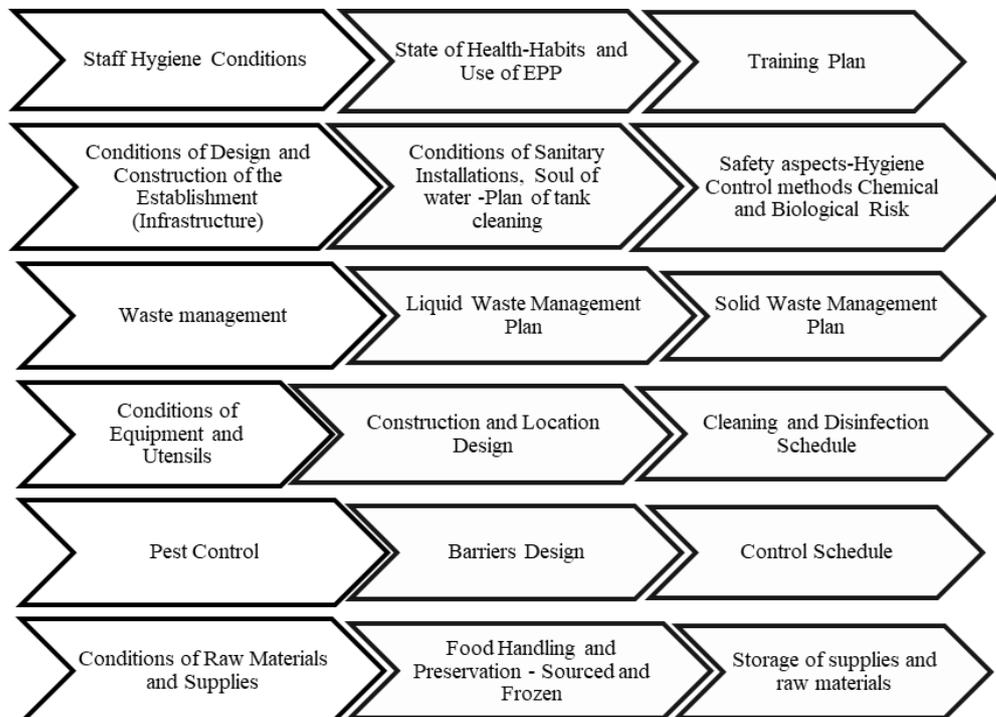


Figure 1. Operational model

4. Conclusions

The results of this study contextualize a reality little studied and indirectly shows the risks that could increase the existing relationship between good manufacturing practices and labor productivity by the workers of this complex, in this sense, evidence of the increase in disabilities due to poor sanitary control.

This study presents strengths, since it takes as a basis the national legislation to determine the safety conditions and good manufacturing practices inside the canteens of the military complex because its results are the starting point for the implementation of internal policies that improve the practices and positively impact the quality of life of both internal staff and external personnel, since empirical evidence argues that these practices have a direct relationship with risks associated with public health. The reduction of these risks protects the life and health of the people who are concentrated there and coexist most of the time for working conditions as this is a "special regime".

Similarly, analysis was a fundamental contribution, this being the main input that will support the quality management systems and the occupational safety and health management system of the military complex, from which actions included within both systems emerge. Compliance with minimum requirements for management systems, this being the beginning for the establishment of new policies and improvement actions that guarantee the reduction of absenteeism at work due to multiple gastrointestinal infections.

Bearing in mind that safety is synonymous with impeccability and this is necessary in terms of nutritional quality, since the only guarantee to prevent foodborne diseases is to ensure that handling, preservation, cleaning, disinfection and other operations committed to the process of preparation and serving of food are carried out respecting quality parameters.

The analysis was based on a business need, finding that the negative aspects in the dining halls cause absenteeism in the workforce and then decrease productivity resulting from absence at work, it is necessary to affirm that there is a direct relationship between transmitted diseases for food and medical work disabilities, evidencing that it is urgent for the company to establish a tool that guarantees safe products under sanitary conditions: Implementation of Good Manufacturing Practices -BPM duly documented based on the requirements of current legislation regarding the minimum requirements that a company dedicated to the preparation and / or distribution of food must meet.

Said plan must of BPM must draw a clear line in sanitary matter adapted and personalized to the nature of the military complex and its activities as special regime, a scale of name is proposed "Scale Security-BPM", strategically designed based on three levels the first level of blue color that refers to the variables themselves aimed at improving safety conditions and good manufacturing practices, the second and third level we find the criteria that make up each variable. In the same sense, the company in question must design within the documentation of BPM and Security a sanitation plan where it is captured and subsequently executed the conditions of operability regarding proper waste management demonstrating efficient collection of waste from the raw material, fats and oils assuring their final disposal, in this way criteria for cleaning and disinfection with duly established procedures taking into account agents, products, substances and concentrations used for these tasks; demonstrating pest management and control of pests and rodents, indicate and document within this plan that there are controls to ensure compliance with the physicochemical and microbiological requirements of drinking water used and stored in tanks that have a cleaning and disinfection schedule.

The implementation plan of good manufacturing practices must go hand in hand with the Occupational Health and Safety Management System, this cannot be carried out in isolation, that is, that the BPM plan must have a focus on risks and be part of the Occupational Health and Safety Management System, where both safety and hygiene aspects (lighting, temperature, ventilation, noise, etc.) must be taken into account so that this becomes a strategy to reduce work-related disabilities for foodborne diseases ETA and therefore the implementation of BPM becomes a fundamental tool for increasing productivity and decreasing indices of absenteeism.

Conflict of Interest.

The authors report there are no conflicts of interest.

References

- [1] Gonzalez T 2005 Foodborne diseases and PCR prevention and diagnosis. *Salud publica de Mexico* 388.
- [2] Yuniesky G 2012 Actions for the management of sanitary quality and safety. *Journal of Health Management and Policies* 140.
- [3] Martinez, & Ceballos 2007 Outbreaks of foodborne diseases. *Epidemiological Bulletin* 241-252.
- [4] World Health Organization (WHO) 2001 Food safety. *Secretary's report Executive Council*.
- [5] Ministry of Health of Chile 2010 Sanitary regulation of Chilean foods. Lexnova editions.
- [6] Bastías J. M., Cuadra, M., Muñoz, O., & Quevedo, R 2013 Correlation between good manufacturing practices and compliance with microbiological criteria in the manufacture of ice cream in Chile. *Chilean nutrition magazine*.
- [7] Kopper G 2009 Diseases transmitted by food and its socioeconomic impact. Rome.
- [8] Sansawat and Terry 2011 Review of the standards of food safety management and design and manufacture of food packaging. Sgs.
- [9] Vega M., & Guerrero V 2015 Design and proposal of a food safety system based on BPM (Good Manufacturing Practices) for Destiny Hotel in the city of Baños. *Digital Repository - Central University of Ecuador*.
- [10] Tafur 2009 Food safety and international trade. *Colombian Journal of Animal Sciences*.
- [11] Pérez-Silva Belmonte, & Martínez 1998 Microbiological study of foods prepared in high-risk collective dining rooms. *Spanish magazine of Public Health*.
- [12] Alerte V., Diaz J., Voltaire J., & Espinoza 2012 Outbreaks of diseases transmitted by food and water in the Metropolitan Region, Chile (2005-2010). *Chilean Journal of Infectology*.
- [13] Ministry of Health of Medellin 2017 Epidemiological Bulletin: Diseases transmitted by food.
- [14] Arcos J., & Jeanette A 2013 Risk factors associated with the emergence of foodborne diseases that are sold in school bars in ambato health area. *Digital Repository - University of Ambato*.