STUDIES PEER THE NEW STRATEGIES FOR HYGIENE IN SPACES FOR FOOD PRODUCTION AND RESTAURANTS

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Abstract

A natural phenomen represents biocontamination in provision areas and from the food production ,restaurantse, and turism. This areas besides the fact that they can`t offer safety for aliments, they can be a true source for illnes of those customer.
To prevent the contamination of aliments in necessary the implementation for new methods, preventing the initially stage of biocontamination, this that cabe realised trought modification of work conditions, the corect administration of the hygienic and dezinfection operation, analyse risks. A special attention must be granted of catering because indifferent of the consumer sphere to wich they adress, this products must to present alimentation safety realized by the highest standarts. Products biocontamination by the pathogenic bacteria and specially by those who are strong and they can produce food –borne intoxications from the most severe. One of the most popular bacterium wich can produce this illnes, that belong to: Listeria, Salmonella, Escherichia coli, Bacillus etc. The limitation of the microbiological contamination of the surfaces modifies the interactions wich can establish in common mode between surfaces and diferent materials and corps wich enter in connection with this.

Introduction

Sanitation and disinfection operations do not always guarantee the safeness of the surfaces used for alimentary products. The final result of the sanitation and disinfection operations depend on the used hygiene protocol, on the level of existing deposits of dirt on the respective surfaces, on the type of dirt (acid dirt, basic dirt) on the operator executing the sanitation operation followed by the one of disinfection. It is very important to supervise and validate the sanitation and disinfection operations.

The sanitation and disinfection operations have to be organized taking into account the pre-established objectives of the sanitation state we

want to obtain and that depends on whether we want to perform only to an intermediary cleaning in the production cycle or if we refer to the final process of cleaning at the end of the production cycle, and in the case of public alimentation units to the sanitation process performed at the end of the day.

Before performing the execution plan for the sanitation and disinfection operations, the targeted objectives have to be well determined. Knowing the importance of the effectiveness of these operations is vital to understand that:

Through the sanitation process a possible risk of quality issues regarding the products obtained can be prevented. Risk free products can be obtained.

Imperfections of the sanitation and disinfection operations are identified.

We obtain an increase in the degree of awareness and education of the personnel that executes the operations and an increase of their vigilance.

They represent a way to get to know better the states of the surfaces.

This way we can visualize and identify the areas that are more difficult to sanitize and that can create problems because of dirt deposits accumulation, biofilm formation.

Experimental

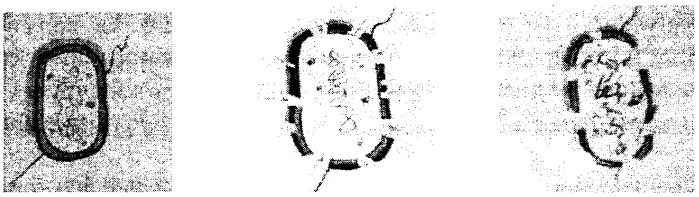
For identification purposes different sanitizing agents have been used on the same number of microorganisms present on a certain surface, performing this way comparisons on the same basis. The microbial load was varied, verifying through insemination the total number of germs, and after various time parameters of contact with the studied sanitizing agents, the number of surviving germs has been verified. Analysis operations have been conducted in parallel to study the action of the sanitizing agents with the strongest impact on pure cultures of resistant sporulated bacteria, under the form of analysis of *Bacillus subtilis* for the observation of the impact of combined sanitizing agents.

Results and Discussions

This work has been executed to facilitate the creation of a hygiene maintenance protocol for the alimentary industry production companies, catering services units and fast food restaurants. Some of the antiseptics that

have received the license to be commercialized can be considered as medication in other fields, together with the antibiotics they represent weapons fighting against infections and in the last years they have reached an increased importance in the insurance of the production of safe alimentary products.

The selection criteria of these agents is represented by: the ease of use, the toxicity degree for the user, the remanence after cleaning, the interaction with other alimentary residues, the action area covered by the sanitizing agent, its cost. The order of the importance of the criteria is not the one in which they're nominated, because all or just part of the aspects can have priority, depending on the final purpose to be attained. If we consider washing an operation of cleaning of the organic matter residues and of reducing the number of microorganisms, then sanitation represents the temporary result of the operation that allows the destruction of microorganisms and / or of viruses born by fixed contaminated means. The sanitizing agents belong to a series of substance groups, that have the role to eliminate or destroy the microbes and to deactivate viruses on non-moveable surfaces, in accordance with the established objectives. This operation has this purpose but is applied in a limited way, referring only to the germs that are present in the moment of execution of the disinfection operation, and for this reason there arises the necessity to have a frequent application of it. Antiseptics and disinfectant agents are capable of slowing down the microbial activity (bacteriostatic agents, fungistats, virus agents) or destroying it (bactericides, fungicides, sporicides, viruscides). A great number of disinfectants and antiseptic agents have both qualities. For the operation to be effective, it is necessary to know the action method on the respective surfaces, the level of resistance of the microorganisms represented by the decimal reduction time, the initial number of microorganisms present on the surface, the total final number of microorganisms tolerated on the surface, the duration of the disinfectant's application and its action mechanism so as to obtain the expected objectives through the combination of one or more sanitizing agents. The remanence represents the effect of the disinfectant agent that persists on a surface. The action mechanism of the disinfectants varies from a family of agents to another and has as a purpose the coagulation of intracellular organs, the alteration of the membrane producing numerous perturbations and destructions within the cell. This is accomplished after the penetration of the cellular membrane takes place.



a) b) c)

Fig. 1: a) The cell, b) The cell attacked by a disinfectant, c) The deactivated cell with all its functions altered by the disinfectant agent

In figure 1(a) we have the cell, in the figure 1(b) the cell attacked by a disinfectant, in figure 1(c) the deactivated cell with all its functions altered by the disinfectant agent.

In figure 2 we have the presentation of the average values of the identifications performed on the same suspension of microorganisms observed as a result of the collection by fingerprint from a production surface, through the contact with different disinfectant agents on successive periods of time with a rate of growth of 5 minutes, where it can be observed that a great impact on the microorganisms is shown by the halogen and oxidant agents, both of them presenting a constant rate of destruction of the microorganisms. Though the other disinfectant agents have in certain cases a more effective action on certain types of microorganisms, their use is not recommended because they have a narrow action spectrum and they present inconveniences such as toxicity, corrosion, interaction with other substances. Starting from dilutions of a load of 160 ntg/ml, it has been observed, after the various exposal periods of time of the disinfectants, that their number decreases as the exposal time increases.

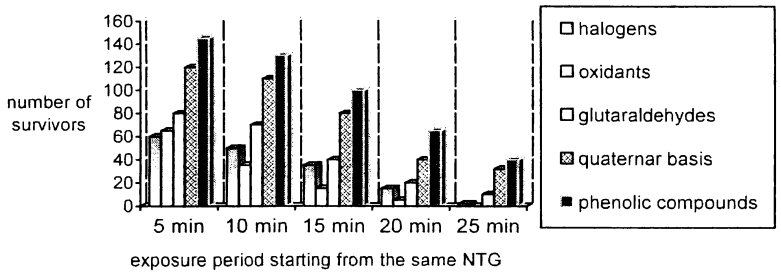


Fig. 2: Comparisons between the reduction activity of the total numbers of germs from a surface

In figure 3 we have the presentation of the comparisons between the action method of the disinfectants in decimal reduction percentages of the number of microorganisms. A high sporicide action can be observed on halogen agents, glutaraldehydes, and oxidants; the other disinfectant substances not presenting any action at all on spores and viruses or their action being insignificant. On the basis of these tables and taking into account the compatibility of the disinfectants and the nature of the microorganisms, of the production machinery and not last of all, of the costs, the disinfection strategy is chosen.

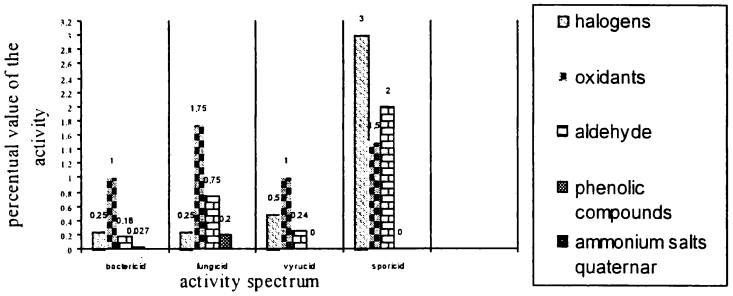


Fig. 3: Comparisons between the action method of the desinfectants

Following a testing of the disinfectants conducted on pure cultures of bacteria the following results have been obtained (table 1, figure 4, table 2):

Table 1: The action of the sodium hypochlorite on *Bacillus subtilis*

Time / concentration	0.025%	0.2%	0.1%
Initial number of cells	$95x10^5$	$95x10^5$	$95x10^5$
No. of cells after 5 min	$432x10^2$	$275x10^2$	$115x10^2$
No. of cells after 15 min	238x10	176x10	94x10
No. of cells after 30 min	150	70	20

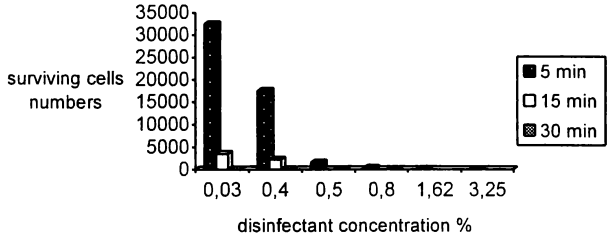


Fig. 4: The action of the peracetic acid

Table 2: Results of the testing conducted with peracetic acid

Time / concentration	0.025%	0.4%	0.5%	0.8%	1.63%	3.25
Initial number of cells	$95x10^5$	$95x10^5$	$95x10^5$	$95x10^5$	$95x10^5$	$95x10^5$
No. of cells after 5 min	$400x10^2$	$13x10^2$	$18x10^2$	$1,21x10^2$	$0.24x10^2$	0.3x10
No. of cells after 15 min	23,2x10	6x10	3,4x10	0.6x10	-	-
No. of cells after 30 min	-	-	-	-	-	-

Conclusions

Knowing the mechanism through which a disinfection product can determine the destruction of microorganisms is very important, having as a purpose the identification of the ideal formula to realize the disinfection of a production surface or of a space used for a production process. The difference observed following the studies conducted to determine the method and the time periods of action on the microorganisms, is one of the elements that find themselves at the basis of these researches in this field, in order for the used disinfectant agents to realize their purpose and for their use not to cause a negative impact on the environment or the alimentary products that are being produced in the respective space, and in order to use the proper disinfectants in the optimum concentrations to avoid the appearance of resistance from the part of the germs or mutations of these ones.

After having established which one is the optimum disinfectant for the production section in question, we analyze the risks involved for the machinery used, the costs and of the ones performing the disinfection process (performers). This way the best and most effective way of disinfection can be adopted.

To make this possible, one has to take into account the implementation of the system of analysis of the risk points (HACCP). The sanitation operations can be executed manually or mechanized, through centralized systems, by direct application or aerial application. After having performed the disinfection, it is necessary to adopt the disinfection inspection procedure and quality management, this being part of the management of critical points. The following figure presents the diagram cause – effect adapted in the hygiene maintenance of the surfaces (figure 5).

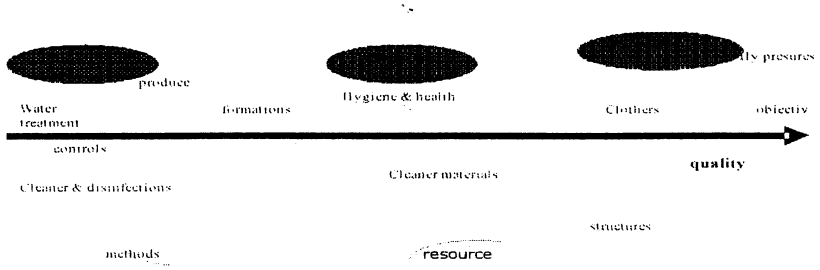


Fig. 5: The diagram cause – effect adapted in the hygiene maintenance of the surfaces

The HCCAP system applied in managing the disinfection activity is one of the new systems of quality insurance and product safeness. And table 3 presents the way of managing the hygiene of the surfaces according to HCCP.

Table 3: The way of managing the hygiene of the surfaces according to HCCP

Works batch constitution Chart of factory Analysis and comprehension **hazards analysis** *Identifications* Regions with hazard	 - Dinginess - Surface - Garrison - Air - Locations
Hazards Hierarchy **Define And Evalution of possible hazards** *management engineering of critical points* policy-marking	 - methods choice - mode of action products (temperature, concentration) - frecvency - favourable moments of interference - washing facillities - accessibility - consumption degree - body,s hygiene
efficiency control **Warranty** cleaner repeat smelting practice supervision **New hazards prevent**	- **Visualfield Of Visionver** - **Microbiological** - **Chemical** - Checking standard specification **from orders** execution. - Controlled of professionality from the operators - Fluctuations run book diary from the enumerated methods about surfaces states

Like that we can administrate the disinfection. If the surviving period is from 3 month we have a determinated colonies numbers from the A, B, C surfaces has been various, we can make a chart of the contamination evolution and like that we can analysit the efficiency of the disinfections work.

The results are permanently surviving end eliminate the hazards posibilitys and created a hi level of foods assurance.

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