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Kitchen, the Forgotten Land of Microbiology: Who Look shall Find

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Abstract

Kitchen and culinary arts are origin of microbiology and biotechnology. Fermentations, microorganism's culture, pasteurization, sterilization and many other scientific processes, have their origin, in culinary processes that are more or less handmade. Now, when biotechnology and microbiology are part of our daily lives, we have put aside microbiology in the kitchen. Industrial food and fast food are pretty safe, but no questions, when a popular chef on TV, mixes a salad with dirty hands. Perhaps it is time to look again at the kitchen and culinary procedures. Modern hygienic procedures ensure the safety of food, in the kitchen of homes and restaurants. We have stopped looking where we should. European agencies, in charge of epidemiological and food surveillance, EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), have raised the alarm about the increase in diseases caused by micro-organisms typical of foods, such as Salmonella, Listeria and E Coli. If we look among our kitchen utensils, surely we will find unexpected microorganisms and new knowledge. This mini-review shows how in recent years a few researchers have turned their eyes to the kitchen and found surprising and disturbing results.

Keywords: Kitchen; Culinary; Hygiene; Safety; Cross-contamination; Sanitation

Introduction

The incidence of food-borne diseases in Spain, as it happens in most European countries, has increased significantly in recent years [1]. Outbreaks number of infection and intoxication that have occurred continues to be considered to be much higher than those officially recorded. There is a growing percentage of the population exposed to risky situations. Those who eat regularly outside their home, frequently eat ready to eat meals and homemade culinary fans.

The importance of contaminated surfaces in spreading pathogenic microorganisms to foods is already well studied and prevented in food processing, catering and domestic environment [2,3]. But many times we forgot to look in some unusual surfaces like, menus [4], food handlers [5], dishcloths [6], cutting board [7-9] or simply kitchen steel surfaces [10]. Is a fact, that EFSA is trying to ensuring European food safety [11] and ECDC is disquiet due to spreading of *salmonellosis* [12] and others food related microorganism [1] in the recent years.

Discussion

The main question is: why? In our opinion they are three different reasons. First of all, is acquired resistance of food microorganism like *Salmonella* to antibiotics and logical spreading of these strains to food chain [13]. In addition, many of these microorganism, have cross-resistance to biocides and antimicrobial agents like: *Escherichia coli* [14], *Staphylococus aureus* [15], *Listeria monocytogenes* [16] and of course *Salmonella* [17]. It must be borne in mind, that some of these microorganisms are bio film-forming [18], that protect other underlying species and one of the most dangerous are hemorrhagic strains of *Escherichia coli* [19]. Second reason, is effectiveness of hygiene procedures in kitchens during food cooking. Contaminated hands, cutting boards, knives and a low educational level are the perfect vectors of pathogen microorganism [20]. Defective hygiene procedures [21] are in origin of spreading of Salmonella [22,23], Campylobacter [24,25], *Staphylococus aureus* [26] and many other species, associated to kitchen surfaces [27].

Lack of knowledge, in hygiene procedures result in important increase food-borne infections from in-home culinary preparations, including those of kids and infants [28]. The last reason is that surely our hygiene procedures are not adequate. Detergent and bleach-based disinfection procedures are day by day less effectives [29]. Dish-washing does not sufficient to prevent cross- contamination and open a way to create new bio films on kitchen surfaces [30]. Even bleach-based or enzymatic cleaner aren`t enough to assure a full disinfection of home surfaces [31,32].

Interspecies intercommunications help formation of easily to spray bio films [33], Seasonal occurrence of outbreak due to bio films in kitchen surfaces, every time related with *Escherichia coli* or *Staphylococus aureus*, *Salmonella* [4,34,35], it made us suppose that the propagation vector could be the cloths themselves. High content of organic materials in cloths will protect microorganism from biocidal action of detergents and bleach [36,37]. These cross-contaminated cloths are perfects to shoot bio films over kitchen surfaces [38].

Conclusion

If we do not look with a critical eye towards the kitchen and the culinary, forgetting where we come from, there is a risk that the food toxins continue their extension and the problem becomes uncontrollable. The cross resistance to the biocides, the poorly trained professionals or fans to the homemade kitchen, and finally the presence of bacterial load in the cloths, are problems that the scientists cannot leave aside, only because they happen in our kitchen. Its time see what is behind the menu.

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