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Editorial

Evaluation of the Effect of Some Biocides on Bacteriophage

Sadik Kalayci*

Department of Genetics and Bioengineering, Faculty of Engineering, Yeditepe University, Turkey

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***Corresponding author**

Sadik Kalayci, Department of Genetics and Bioengineering, Faculty of Engineering, Yeditepe University, 34755 Kayisdagi, Istanbul, Turkey, Email: sadik.kalayci81@gmail.com

Editorial

The most efficient ways to inhibit the growth of microorganisms are the use of well-designed biocides by a rational running of the process providing good production of hygiene [1]. Biocidal products are active substances and chemicals containing one or more active substances intended to demolish, render harmless, hinder the action or exert a controlling action on any harmful organism by chemical or biological means [2]. These products ensure a high level of protection for humans, animals and the environment.

A number of active substances have been authorized for use as biocidal products in the food industry in the past years [3]. Sodium hypochlorite, chloramine, hydrogen peroxide, peracetic acid, quaternary ammonium compounds, alcohol derivatives, salicylic acid, lactic acid, glutaraldehyde, N-(3-aminopropil)-N-dodecilpropan-1,3-diamin, chlorine dioxide, polyhexamethylene biguanide and active oxygen are the most known active substances used in the food industry. Active chlorine (sodium hypochlorite) is the most important one and possesses a wide antimicrobial spectrum. It is used as a wound disinfectant and irrigation solution for bladder and vaginal infections when diluted. At higher concentrations, they are used to disinfect haemodialysis equipment and surfaces [4]. Active chlorine remains a strong veridical biocide and is therefore recommended as a standard disinfectant against viral pathogens [5]. However, active chlorine achieved a rapid inactivation (>4 log inactivation) within 30 second while peracetic acid (1%) was shown to achieve this level of inactivation within such a short contact time alone [6].

The current technologies used to inactivate bacterial pathogens in foods are not infallible, as proved by the continuous increase in several food-borne diseases caused by pathogens, such as Salmonella, Campylobacter, Escherichia coli and Listeria [7]. On the other hand bacteriophage infection is the very important cause of slow acid production by lactic acid bacteria during industrial fermentations. This problem is confronted by all dairy industries, which manufacture cheeses and milks [8]. The phages still demonstrate a significant risk for milk fermentation problems which can also decrease product quality [9]. *Lactococcus lactis subsp, Streptococcus thermophilus, Lactobacillus spp* are the mostly used strains in milk industry. However, they are more prone to be infected by bacteriophages [10].

The phagicidal activity of biocidal products against the virulent bacteriophage P001 (*Lactococcuslactis. lactis* bacteriophage P001 DSM 4262) and P008 (*Lactococcuslactis subsp*. lactis bacteriophage P008 DSM 10567) infecting lactic acid bacteria are analyzed based on the European suspension test as described in European standard EN 13610 (DSMZ bacteria collection, Braunschweig, Germany).

A surface test has also been developed in our laboratories. Eight different formulations were tested under the same conditions with EN 13610. Table 1 shows the inactivation rates of these formulations. Briefly, the inactivation rates were observed from the formulations containing alcohol (50 % Ethanol, 10% Propan-2-ol): >4 logs, hydrogen peroxide (1.5 %): >4 logs, glutaraldehyde (0.09 %): <4 logs, chlorine (1000 ppm): >4 logs, chlorine dioxide (0.2 %): >4 log, Peracetic acid (0.1 %): >4 log, quaternary ammonium (0.5%): >4 log, active oxygen (0.05 %):<4 log.

All biocides except glutaraldehyde and active oxygen are shown to be effective (> 4 log) on the basis of EN 13610 conditions on both strains at the given concentrations. It is apparent that the most effective of biocide among these [11] is active chlorine according to the experimental results. Theperacetic acid and chlorine dioxide are also effective. Although many biocides are used to control of these phages, it may lead to many problems in the field of food and cause product loss.

Table 1: The microorganism's inactivation rates of the eight different formulations.

Microorganisms/Biocides	Alcohol (% 60)	Hydrogen peroxide (% 1.5)	Glutaraldehyde (% 0.09)	Active Chlorine (1000ppm)	Chlorine dioxide (% 0.2)	Peracetic Acid (% 0.1)	Quaternary Ammonium Compounds (% 0.5)	Active oxygen (% 0.05)
Lactococcuslactis subsp. lactis bacteriophage P001 DSM 4262	4.17 log	4.55 log	3.88 log	5.67 log	5.05 log	5.18 log	4.92 log	3.92 log
Lactococcuslactis subsp. lactis bacteriophage P008 DSM 10567	4.05 log	4.22 log	3.17 log	5.62 log	5.45 log	5.35 log	4.17 log	3.73 log

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