

Peracetic acid and atmospheric plasma as alternatives for packaging disinfection in the dairy industry

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Date submitted: 28/12/2015

Date accepted: 04/02/2016

Volume/Page(s): 69/2-6

Abstract

In the dairy industry disinfection of packaging material is an established process step. Nowadays the mostly applied disinfection method of packaging materials and machinery is hydrogen peroxide disinfection. Disinfection with atmospheric plasma and peracetic acid are alternatives. In this study the two hydrogen peroxide disinfection alternatives were evaluated for their antimicrobial effect and their interaction with packaging material and packaged good.

To analyze the efficiency of alternative disinfection methods and interactions between packaged goods and packaging materials, films of common coffee cream portion cups were used. The microbial reduction rate was investigated by the wet/dry swap technique (DIN 10113-1: 1997-07) using *Bacillus subtilis* and *Aspergillus niger*. Interactions between disinfection method and packaging material were measured by seal strength (DIN 55529:2005-09) and contact angle measurement (DIN 55660-2). Sensory influences on the packaged goods were detected by using the triangle test (DIN EN ISO 4120). Microbial test showed that the microbial reduction rate of atmospheric plasma was lower than the microbial reduction rate of hydrogen peroxide due to the chosen parameters for atmospheric plasma whereas the microbial reduction of peracetic acid was as effective as of hydrogen peroxide. The sensory test showed that the different disinfection methods had no effect on the flavour of packaged goods. Atmospheric plasma caused a considerably smaller contact angle than both chemical disinfection methods. The seal strength test showed no significant difference ($P > 0.05$) neither between hydrogen peroxide and peracetic acid nor between untreated sample and atmospheric plasma but a significant difference ($P < 0.05$) between these two groups. In the sealing range of 190 - 240 °C the seal strengths were around 8 N/15mm. The results of atmospheric plasma disinfection showed the need for additional tests with different plasma doses in order to generate a higher microbial reduction rate. Experiments with higher plasma doses also require more tests with regard to the packaging material. Consequently, both disinfection methods could be further investigated as alternatives for disinfection with hydrogen peroxide.

Key words: *Bacillus subtilis*, *Aspergillus niger*, hydrogen peroxide, packaging material disinfection, germ reduction, seal strength, contact angle measurement, sensory test