Shock chlorination in emergency situations for cleaning drinking water pipes.

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Category: What can be done in future? / Poster

Summary

Accidental or intentional contaminations by microorganisms of drinking water distribution systems impair water services and safe use of water. These events occur more or less frequently as a result of (i) negative pressures on the network and intrusion of undesirable bugs through leaks, (ii) natural disaster associated with urban inundation, (iii) default in treatment or distribution with a risk of epidemic situation, (iv) back-contaminations of point-of-use which may become points of nosocomial contamination in specific environments as hospital emergency services (*i.e.* contamination by *Pseudomonas*, or *Escherichia coli*), (v) unexpected bloom of microorganisms of sanitary interest (*i.e. Legionella*), and (vi) intentional contamination in the framework of terrorist activities.

Such contaminations determine a crisis situation, which affects or is likely to affect a water utility or its provided services, and require more than the usual means of operation and/or organizational structures to deal with it. Indeed cleaning and effective disinfection of the water systems is requested. The issue is complex as undesirable biological contaminants will be found not only in the water bulk but also associated to the pipe walls and the biofilm/deposits.

High chlorination of drinking water systems is generally recommended and applied in emergency situations. Little is known about the effect of such high chlorination on multispecies autochthonous biofilm grown on polymeric (*i.e.* non corroded) materials.

In this work continuous chlorination (12 mg/L Cl_2) was tested in dynamic conditions (Propella™ reactor) on 6-month-old biofilms/deposits grown mainly on HDPE (high density polyethylene). Before disinfection, the pipes surface was covered with patchy macroscopic brown deposits (around 1 mm in thickness) representing around 47 µg/cm^2 of organic matter associated to microbial cells (5.4×10^6/cm^2) and a sticky biofilm composed of organic matter (around 58 µg/cm^2 of TOC), and 4.8×10^7 cells/cm^2.

The results show both a well-known disinfecting effect of chlorine and its ability to alter soft deposits mechanical properties, which are washed out by the water flow. However 20 % of the bacterial cells (very damaged by the chlorine or even dead) remained attached at the treated surface even after several days of exposure to the oxidant.

Acknowledgments
The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2011) under grant agreement n° 217976 (project SecurEau).