

Inactivation Kinetics of DNA and RNA Viruses by Ozone-Air Mixture in a Flow Mixer

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Abstract : Virucidal activity of ozone is well known: dissolved in water it kill viruses very fast. The virucidal capacity of ozone in ozone-air mixture is less known. The goal of the study was to investigate the virucidal potentials of the ozone-air mixture and kinetics of virus inactivation. Materials and methods. Ozone (O₃) was generated from oxygen with ozonizer (1.0 - 75.0 mg/l). The ozone concentration was determined by the spectrophotometric methods. Virus contaminated samples were placed into the flowing reactor. Viruses: poliovirus type 1, vaccine strain (Sabin) and adenovirus, type 5, were obtained from the State virus collection. Titrations of viruses were carried out in appropriate cell cultures. CxT value (mg/l x min) was calculated. Results. Metallic, polycarbonic and fiber "Kevlar" samples were contaminated with virus, dried and treated with ozone-air mixture in the flowing reactor. Kinetics of poliovirus inactivation: in 15 min at 5.0 mg/l -2.0 lg TCID₅₀ inhibition, in 15 min at 10 mg/l - 2.5 lg TCID₅₀, 4.0 lg TCID₅₀ inactivation of poliovirus was achieved after 75min at ozone concentration 20.0mg/l (99.99%). (CxT = 75, 150 and 1500 mg/l x min on all three types of surfaces). It was found that the inactivation of poliovirus was more effective when the virus contaminated samples were wet (in 15 min at 20mg/l inhibition of virus in dry samples was 2.0 TCID₅₀, in wet samples - 4.0 TCID₅₀). Adenovirus was less resistant to ozone treatment than poliovirus: 4.0 lg TCID₅₀ inhibition was observed after 30 min of the treatment with ozone at 20mg/l (CxT mg/l x min = 300 for adenovirus as for poliovirus it was 1500). Conclusion. It was found that ozone-air mixture inactivates viruses at rather high concentrations (compared to the reported effect of ozone dissolved in water). Despite of that there is a difference in the resistance to ozone action between viruses - poliovirus is more resistant than adenovirus-ozone-air mixture can be used for disinfection of large rooms. The maintaining of the virus-contaminated surfaces in wet condition allow to decrease the ozone load for virus inactivation.

Keywords : adenovirus, disinfection, ozone, poliovirus

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