

A Scandinavian emergency for drinking water network contamination: the Nokia case study

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In Finland, 65 waterborne outbreaks resulting in 27,200 illnesses were detected between 1998 – 2009. The outbreaks were typically associated with the use of un-disinfected ground water supplies. In most of the outbreaks the first indication of an outbreak was an increase of gastroenteritis cases amongst consumers. The boiling advice of drinking water was the most common primary mitigation action taken. In many contamination cases, the use of contaminated water supplies was stopped and an alternative water source was taken into use. The simplest chemical treatment to inactivate microbes has been to use chlorination combined with flushing. Shock chlorination/ pipeline internal gauging (pigging) or air-water pulse cleaning have also been applied in the most severe contamination cases.

A severe drinking water contamination/outbreak occurred in Nokia city (30,000 inhabitants) in November 2007. A cross-connection between waste water system and DW pipeline system caused a massive faecal contamination of drinking water distribution network. The first signals of contamination concerning customer complaints (odd colour, taste, smell) were ignored. The appearance of first illness cases finally resulted in the recognition of the outbreak. Extremely high counts of indicator bacteria were detected from drinking water. Later on *Campylobacter sp.*, *Giardia sp.*, noroviruses, *Salmonella enteritidis*, rota-, entero-, astro-, rota- and adenoviruses were also detected from water samples. Flushing of the network was started immediately after the faulty connection between the wastewater line and tap water line was cut. The first mitigation action besides the boiling water advisory was chlorination (1.5 - 5.0 mg/l). Information on the contaminated water and boiling water advisory was spread using the local radio channels, Internet, TV and newspapers. Leaflets and loudspeaker cars were used to inform the public. Also, centres including schools, food factories and hospitals were informed about the drinking water contamination. The boiling water advisory continued for almost three months. Enhanced chlorination was found insufficient to clean the badly contaminated pipelines. This resulted in the use of pipeline internal gauging (pigging), air/water pulsed flushing and finally shock chlorination (10 mg/l, 24 h) to clean the pipelines. The network was finally declared to be clean in February 2008. A population survey conducted in Nokia and neighbouring town showed a total of 8,451 cases of gastroenteritis during the outbreak; 1000 persons sought care at the municipal health centre and nearly 200 were treated in hospital. Total costs of the outbreak including the mitigation actions exceeded 3.7 million euros. The lessons learned from this major emergency relating to drinking water contamination will be described.