Exposure to heat transfer fluid leakage in drinking water systems

Drinking water circuits are sometimes connected to heat transfer circuits by means of a non-return valve. This heat transfer circuit can then potentially contaminate the drinking water system if the non-return valve malfunctions (leaving it partially open). Depending on the instantaneous pressure conditions at the connection point, the heat transfer fluid may leak into the drinking water circuit either occasionally or continuously. This device malfunction may go unnoticed for a period of time.

The regulations on the marketing of heat transfer fluids needed to be updated to clarify for manufacturers the minimum health requirements these products must meet before being placed on the market, to ensure the safety of drinking water. In this context, the Directorate General for Health (DGS) called on the French toxicovigilance network and poison control centres (PCCs) to analyse cases of accidental exposure due to leakage of heat transfer fluids into drinking water systems. The PCCs studied the cases collected from 01/01/2008 to 30/09/2015. They compiled an inventory of the products and substances involved in these accidents, analysed the levels of exposure, and examined the dossiers of the patients concerned.

One hundred and ninety-one cases were identified, a quarter of which involved children under 15 years of age. In three of these 191 cases, information on symptoms was missing. In total, of the remaining 188 cases, only 48 cases (26%) were symptomatic, with all of them having mild initial symptoms (mainly digestive signs such as abdominal pain, diarrhoea, nausea, or neurological/sensory disorders such as headaches). The outcome was favourable in all cases where progression was known.

The products involved varied according to the system. Specific heat transfer fluids may be combined with one or more additives such as biocides, corrosion inhibitors, stop-leak agents, surfactants and pH adjusters. Alternatively, the water may be untreated but kept in a closed circuit. In this case, it can potentially be contaminated by degradation products from the circuit and possibly by micro-organisms. A total of 373 mixtures were identified in these dossiers, belonging to two classes in the PCCs' National Database on Products and Compositions (BNPC): specific heat transfer fluids and heat transfer system additives.

As expected, the origin of the contamination was essentially due to a return of water containing heat transfer fluid at the point where it was connected to the drinking water system. When mentioned in the dossiers, the exposure was of short duration when the contamination was evident (change in colour or taste of the water, appearance of foam). More subtle pollution (lasting from one day to three weeks) was only discovered when the interconnection between the two systems was examined. The highest number of cases was observed in October and December, corresponding to the period when the heating systems were back in use again.

In view of the observations analysed over the study period, contamination of a drinking water system by a heat transfer fluid does not therefore appear to have any significant consequences for the health of anyone briefly exposed. Given the composition of the fluids, the benign nature of these cases is probably due to the extent of dilution or the low dose ingested when the contamination was detected visually or by taste.

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http://www.centres-antipoison.net/CCTV/CCTV_Rapport_Contamination_fluide_caloporteur_2008_2015_VMISE_A_JOUR.pdf