**Memorandum and proposal for the reuse of FFP2 and FFP3 respirators after decontamination with hydrogen peroxide vapour**

Abstract

Background: The COVID-19 pandemic has intensified the demand for protective respirators and other personal protective equipment (PPE). There is so far no domestic production of respirators in Finland, and international companies have not been able to provide a sufficient supply to the market. In certain hospital tasks, Covid-19 patients cannot be cared for without using FFP2 or FFP3 respirators. In this exceptional situation it was important to investigate the possibilities for efficient and safe decontamination of these respirators as one option to ensure their adequate supply in hospitals.

Aim and objectives: The aim of the project for reuse of respirators was to establish the infrastructure and processes for decontamination of respirators. The objective was to validate the suitability of hydrogen peroxide vapour for decontamination of FFP2 and FFP3 respirators, including the appropriate technical parameters required, as well as to develop a large scale decontamination process, ensuring at the same time the efficiency, quality and safety of the processes. An objective was also to develop the infrastructure and the organizational network for the decontamination of disposable personal protective equipment, which could be activated rapidly.

Methods: The Finnish Defence Research Agency (FDRA) and the Technical Research Centre of Finland Ltd (VTT) have since 2013 developed methodology based on hydrogen peroxide vapour for decontamination of biological contamination. VTT performed in the current project the laboratory testing for defining the technical parameters of the hydrogen peroxide treatment process. FDRA and VTT designed and built a decontamination chamber for large scale hydrogen peroxide vapour treatment in a 12-meter sea container. FDRA built the comprehensive facility for hydrogen peroxide vapour treatment. Initially, three hospitals with intensive care units, and later most of the hospitals with intensive care units collected used FFP2 and FFP3 respirators for large scale decontamination.

Results: In laboratory testing, as well as in the large-scale decontamination facility, hydrogen peroxide vapour decontamination effectively destroyed both the standard biological indicator as well as the model virus employed. Used respirators decontaminated with hydrogen peroxide vapour met in testing the standard criteria for at least FFP2 level respirators as regards their filtering efficiency and breathing resistance, as well as the fit testing by the Finnish Institute for Occupational Health (FIOH).

The independent expert group assessment: As a conclusion, the expert group states that, based on results reviewed, the decontamination of respirators in the hydrogen peroxide vapour chamber is an appropriate treatment both as regards the achieved decontamination as well as retaining the properties of the respirators. For the whole process, a few issues related to the packing and storage of decontaminated respirators remain to be investigated. The expert group wishes that these issues can be solved, to enable the use of the methodology, in case an exceptional situation arises, in which respirators are not available by other means. It is recommended that the well-established collection of used respirators for decontamination be continued for the time being.

Conclusions: The decontamination of respirators by hydrogen peroxide vapour is effective and safe. In a situation, where new FFP2 and FFP3 respirators are not available, it is possible to implement their decontamination to ensure safe reuse.