International Standardization of Testing Perceived Air Quality and the supporting information from *in silico* model for transport efficiency of acetone from indoor to olfactory epithelium cells

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ABSTRACT

There is an increased interest in the development of air cleaners. The performance of air cleaners is generally evaluated by the removal efficiency defined by the ratio in concentration of pollutants downstream and upstream the air cleaners, which is consequently used to calculate clean air delivery rate. The removal efficiency is not usually determined using the rating of air quality as perceived by people, although it has been used to determine ventilation requirements prescribed by standards in many parts of the world. Moreover, measurements of chemical compounds will seldom capture all pollutants and even though no models exist to describe how they will be perceived by building occupants. Therefore, examining the effect on perceived air quality (PAQ) seems relevant and should be considered as a supplementary method to chemical measurements.
Against above background, ISO/TC146/SC6/WG25 is working on the international standardization of Testing Perceived Air Quality, ISO 16000-44 “Test method for measuring perceived indoor air quality for use in testing the performance of gas phase air cleaners”.
In this report, firstly, the current status of ISO 16000-44 is briefly introduced and continuously the supporting information of international standardization from *in silico* model for transport efficiency of acetone from indoor to olfactory epithelium cells is introduced. As for *in silico* model analysis, the transport dynamics of inhaled gaseous odorants in the respiratory tract and the characteristics of the adsorption flux on the olfactory epithelium tissue are numerically investigated. Following the procedure of the perceptive air quality test described in ISO 16000-44, we analyzed the adsorption flux on the olfactory epithelium tissue under transient breathing conditions using a coupled computational fluid dynamics (CFD)-physiologically based pharmacokinetic (PBPK) model. Through the analysis, we obtained the following results: (1) The inhaled odorant concentration varied with the unsteady breathing cycle. (2) The adsorption flux on the olfactory epithelium tissue was low compared to that in the other nasal regions. (3) The difference in the adsorption fraction in the olfactory epithelium region was confirmed between the orthonasal and retronasal pathways. (4) Adsorption flux became nearly steady after 3 breathing cycles.

KEYWORDS

olfactory odorant uptake, numerical respiratory tract model, physiologically based pharmacokinetic model, computational fluid dynamics, sensory test, perceived air quality, air purifier