전자담배의 에어로졸 유동 및 폐에서의 거동 분석

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Electronic Cigarette's Aerosols Flow and Deposition Through the Lungs

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Abstract : Electronic cigarettes have been rising in popularity in recent years due to being advertised as healthier alternatives to conventional cigarettes. Even though manufacturers say that e-cigs are not harmful as their conventional alternatives, these claims are not supported by any research papers. The main aim of this study is to study the flow of e-cig's aerosols and simulate their deposition in the lungs so we can use this knowledge in order to be able to asses short and long term health effects.

1. Introduction

According to recent studies, such as that by Fuoco et al[1], e-cigs and conventional cigarettes have similar particle concentration and particle distribution. These findings lead us to believe that e-cigs are not as healthy as they are claimed to be. Also according to Pichelstrofer et al[2], the flow and deposition of aerosols in the lungs is dependent on a lot of factors such as vapor and temperature. That's why the deposition of the aerosols differs between lung airway generations. Due to this we want to do accurate simulations of the flow of aerosols through the lungs and their deposition in order to be able to give accurate estimations of short and long term health effects

2. Body

As a first step we will do simulations for the aerosols through a tube similar to the ADiC model[3] in order to simulate the effects of vapor and temperature etc. on the aerosols. After that we will try to simulate the flow of aerosols through the lungs and different lung airway generations in order to get a clearer idea of the deposition of aerosols.

3. Conclusion

E-cigarettes are growing in popularity at an alarming rate, especially with adolescents, due to the fact they have different flavors and to being advertised as healthier alternatives when compared to conventional cigarettes. However as research have found that e-cigs and conventional cigarettes have similar particle concentration and distribution. The aim of the study is to simulate the flow and deposition of the aerosols in the lungs and see the effects of vapor and temperature on it.

References

(1) Fuoco et. al 2014, “Influential Parameters on Particle Concentration and Size Distribution in the Mainstream of E-Cigarette”, Environmental Pollution (184) pp. 523-529

(2) Pichelstorfer et al 2015, “Modeling Aerosol Dynamics of Cigarette Smoke in a Denuder Tube”, Journal of Aerosol Science 88, pp. 72-89.

(3) Pichelstorfer et al 2016, “Simulation of Aerosol Dynamics and Deposition of Combustible and Electronic Cigarette Aerosols in the Human Respiratory Tract”, Journal of Aerosol Science 99, pp. 125-132