

COLLOQUIUM

In accordance with article 4.1.6.3 of the SSNS-wb.

Group: Engineering Fluid Dynamics

As part of his MSc thesis assignment

Koen Stegeman

will give a presentation, entitled:

Aerosol Deposition in Compliant Tubes

Date: Friday, September 24, 2010

Time: 14:00

Room: Horstring N-109 (Filmzaal)

Summary:

The human respiratory system has a geometry that inhibits the inhalation of foreign particles. This prevents that the particles cause allergic reactions. Relatively large particles will deposit in the throat to end up in the stomach, while relatively small particles will be breathed in and out. To effectively deliver therapeutic aerosol, a detailed understanding is needed of the trajectory of these particles and their deposition in the respiratory system.

Forced expiration could prevent therapeutic aerosols upon inhalation from being breathed out, due to impaction and turbulence. Because of the high transmural pressure during forced expiration, the lung tube will partially collapse. Since the complex fluid-structure interaction, numerical simulations are necessary to achieve understanding of aerosol deposition during forced expiration.

For validation of the results from the numerical simulations, measurements have been carried out in a Starling resistor. Comparison of numerical results with the measured data have demonstrated that the numerical simulations carried out with the commercial software package Ansys CFX gives a good correlation with the experimental results. The numerical simulations could be used to obtain data on aerosol deposition in different parts of the human respiratory system. A parameter study has been carried out to get insight in the influence of different parameters on particle deposition.

Assessment committee:

Prof.dr.ir. H.W.M. Hoeijmakers (chairman)
Dr.ir. F.H.C. de Jongh (mentor)
Prof.dr.ir. H.F.J.M. Koopman
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