9th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMA2024)
June 3-7, 2024, Lisbon, Portugal

FROM THE NOSE TO THE LUNG: FLUID DYNAMICS OF THE UPPER AIRWAYS

800 - FLUID DYNAMICS AND TRANSPORT PHENOMENA

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Key words: CFD, Fluid Dynamics, Upper Airways, Respiratory System, Naso-pharynx.

ABSTRACT

The Mini-Symposium on "From the Nose to the Lung: Fluid Dynamics of the Upper Airways" aims to explore the diverse aspects of fluid flow in the human airways, with a particular focus on numerical an related experimental studies. This symposium will provide a platform for researchers to present their work on airway fluid mechanics, covering a wide range of topics, including macroscopic flow mechanics, mucus rheology, patient-specific surgery planning for flow-related pathologies or targeted drug/aerosol deposition, etc.

Understanding the complex fluid dynamics in the airways is of importance for diagnosing and treating of various pathologies of the respiratory system. The symposium will showcase cutting-edge research and advancements in this field, shedding light on the complex interplay between airflow patterns, mucus properties, and associated pathological conditions. By addressing experimental and computational approaches, this symposium will foster interdisciplinary collaboration and promote a comprehensive understanding of fluid dynamics in the airways. Potential objectives of the minisymposium are:

- macroscopic fluid dynamics within the airways (naso-pharynx and upper airways):

  Characterizing airflow patterns, pressure gradients, and unsteady flow/turbulence effects in different regions of the respiratory system. Investigations into the effects of airway geometries, such as constrictions or bifurcations, on flow behavior will also be explored. This will provide insights into the fundamental principles governing fluid dynamics in the airways and their implications for respiratory health.

- mucus rheology and its impact on airflow and aerosol generation:

  Addressing the complex viscoelastic properties of mucus, its role in airway clearance, and its influence on flow characteristics. Researchers will share their findings on mucus composition, structure, and behaviour under various physiological and pathological conditions. Understanding mucus rheology is crucial for developing effective treatments for conditions such as cystic fibrosis, chronic obstructive pulmonary disease, and asthma.

- patient-specific surgical planning for flow-related pathologies:

  Highlighting the use of computational modelling and simulation techniques to predict airflow patterns and optimize surgical interventions. Researchers will discuss the integration of patient-specific data, such as airway geometry, respiratory function, and disease progression, into CFD models for accurate preoperative planning. This will showcase the potential of personalized medicine in optimizing surgical outcomes and improving patient care.

This minisymposium will provide ample opportunities for networking and knowledge exchange. Interactive discussions will encourage collaborations among researchers from various disciplines, including biomedical engineering, fluid dynamics, and various clinical disciplines. It aims to advance our understanding of fluid dynamics within the airways and contribute to the development of innovative diagnostic and therapeutic strategies for respiratory disorders.

REFERENCES

As literature sources, exemplary publications from the intended subject area of fluid mechanics in the upper airways are given:

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