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Research aids nasal drug delivery

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RMIT University researchers have developed computer models to design more effective nasal sprays to provide alternate drug delivery to needles or pills.

The models explore deep into the human respiratory airway and focus on particle inhalation, allowing researchers to understand how particles move through the nasal cavity and where they deposit.

The models allow for powerful visualisation and reproduction of these particle flows and deposits.

Professor Jiyuan Tu, Deputy Head of Research and Innovation at RMIT's School of Aerospace, Mechanical and Manufacturing Engineering, is working on the project with the University's Health Innovations Research Institute.

The Federal Government's Australian Research Council has provided more than $1 million to support the work, which also involves collaboration with two US universities - Purdue and Clarkson - and the China National Nanoscience Centre.

Professor Tu, who is working with Dr Kiao Inthavong, a postdoctoral research fellow in his school, said the models enabled researchers to gain a better understanding of the toxicology and therapeutic effects of improved nasal spray devices.

"We are using what's called Computational Fluid Dynamics (CFD)," he

said.

"We have developed sophisticated models of the real respiratory airway from medical imaging techniques (CT and MRI) that includes the oral and nasal cavity, larynx, pharynx, trachea and the upper regions of the lung airway.

"These areas of the respiratory airway are capable of determining how and where the inhaled particles and gases will move and eventually deposit on to the respiratory walls.

"This new technology will significantly assist new findings in biomedical and health research."

Professor Tu said CFD models also allowed insight into determining the health risks and outcomes of exposure to airborne particles and gases.

"These are sometimes difficult to determine using live humans or where invasive experimental techniques are involved," he said.

"For example, the models have tracked asbestos fibres as they enter the nasal cavity and eventually reach the deep lung regions causing lung complications such as mesothelioma."

Professor Tu said the new technology also provided powerful visualisation tools such as vector and contour plots, useful for conveying information such as the air/particle flow dynamics and its behaviour to non-health practitioners.

"For example, doctors can explain the effects of surgical procedures to the patient and family members, or engineers can develop optimised designs of room ventilation," he said.

"These studies of particle inhalation in human respiratory airways are also important for air quality - especially pollution, including dust and smoke - occupational health, dealing with bio-terrorist attacks and infectious disease outbreaks."

RMIT research projects in the emerging field have also involved industry, including the Hastie Group, D&E Air Conditioning, Airlinx and Woodwork Innovation.

Provided by RMIT University