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IIT-M links low breathing frequency with COVID-19 risk

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A team of researchers from the Indian Institute of Technology, Madras (IIT-M) has found that the process of virus-laden droplets being transported into deep lung increases with decreasing breathing frequency.

The research team modeled the breathing frequency in a laboratory and found that low breathing frequency increases the time of residence of the virus and therefore it increases chances of deposition and consequently the infection. Also, the multi-scale lung structure has a significant effect on a person's susceptibility to COVID-19.

The research was led by Prof Mahesh Panchagnula, Department of Applied Mechanics, IIT Madras, with his research scholars Arnab Kumar Mallik and Soumalya Mukherjee, IIT Madras. The findings of this study were published in the international reputed peer-reviewed journal Physics of Fluids.

Elaborating on the need for such research, Prof Panchagnula, said, "The study demonstrates the physical process by which aerosol particles are transported into the deep generations of the lung."

In their research, the team reported that holding the breath and having a low breathing rate can increase the chances of virus deposition in the lungs. The study was conducted to pave the way for developing better therapies and drugs for respiratory infections.

The researchers studied the movement of the fluorescent aerosol particles in capillaries of size ranging from 0.3 to 2 millimetres which covers the range of bronchiole diameters. They found that the deposition is inversely proportional to the aspect ratio of capillaries, which suggests that the droplets are likely to deposit in longer bronchioles.

They found that when the flow of aerosol movement is steady then the particles deposit via the process of diffusion, however, if the flow is turbulent then the particles deposit via the process of impaction.