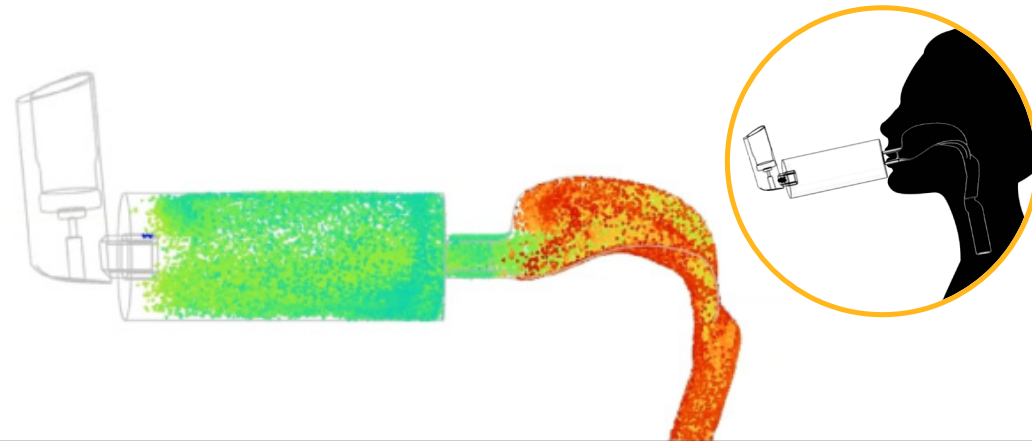
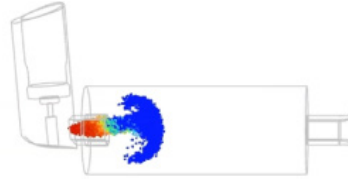


From Inhaler to Lungs – Understanding the Science behind it.

In order to **understand the science** behind how medicine flows from an inhaler into the respiratory system, we need to look at how tiny particles move through the air ("**Particle Dynamics**") and where they land inside the lungs ("**Deposition Mechanism**").

This involves studying the **forces, airflow patterns, and airway shapes** that affect how the medicine is delivered.



Particle Dynamics

... how particles move through air and what influences them

Gravitational Settling (F_g)

This represents the particle's **natural falling velocity in still air**.

Larger or denser particles drop faster and are more likely to settle in the upper airways, so less likely to reach the lungs.

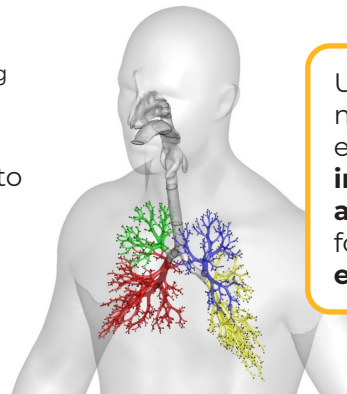
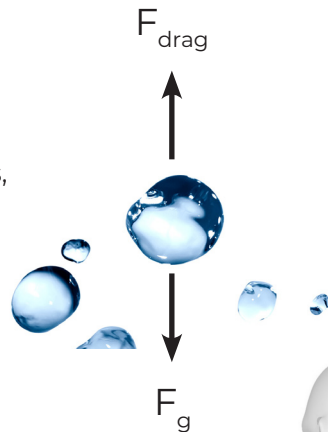
Stokes Law

Stokes Drag Law, describes how **air resistance (drag) slows down particles** moving through air. The smaller and lighter the particle, the less drag it feels.

Other influencing factors:

Particle Relaxation Time – the time it takes for a particle to adjust its speed to match the surrounding air. It indicates how quickly particles can follow or react to flow changes.

Turbulent Dispersion – spreading particles in many directions, affecting where they end up.



Deposition Mechanism

... how and where particles land or stick

When medicine particles travel through the airways, they don't all reach the lungs. Some get stuck along the way due to different factors:

Speed and direction: Fast particles may crash into airway walls if they can't turn quickly (inertial impaction).

Airflow patterns: Swirling or chaotic air can push particles onto the walls (turbulent deposition).

Airway shape: Bends, branches, and narrow sections change where particles land.

Understanding these mechanisms helps explain why **particle size, inhaler technique, and airway geometry** matter for **delivering medicine effectively**.

