ARCUS®:
TECHNOLOGY PLATFORM TO DEVELOP INHALED MEDICINES

WHAT IS ARCUS?

ARCUS is a technology that transforms medicines into light, dry powders, designed to deliver high doses of medication via inhalation[1,2]

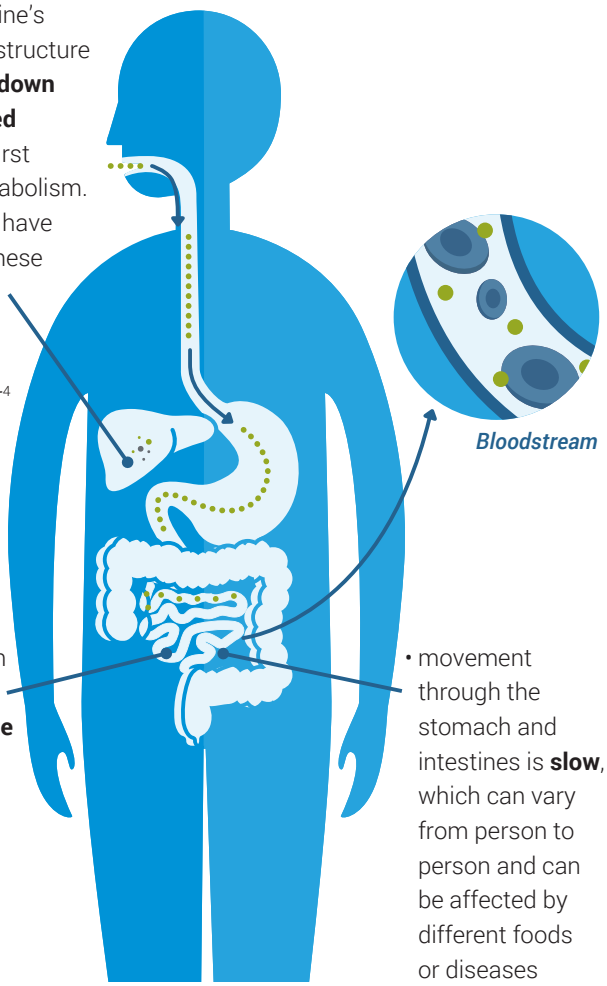
The ARCUS technology platform was initially developed by the lab of Robert S. Langer, Sc.D., David H. Koch Institute Professor at MIT.

This technology has the potential to be used to develop a variety of inhaled medicines, for both **systemic** and **pulmonary conditions**.

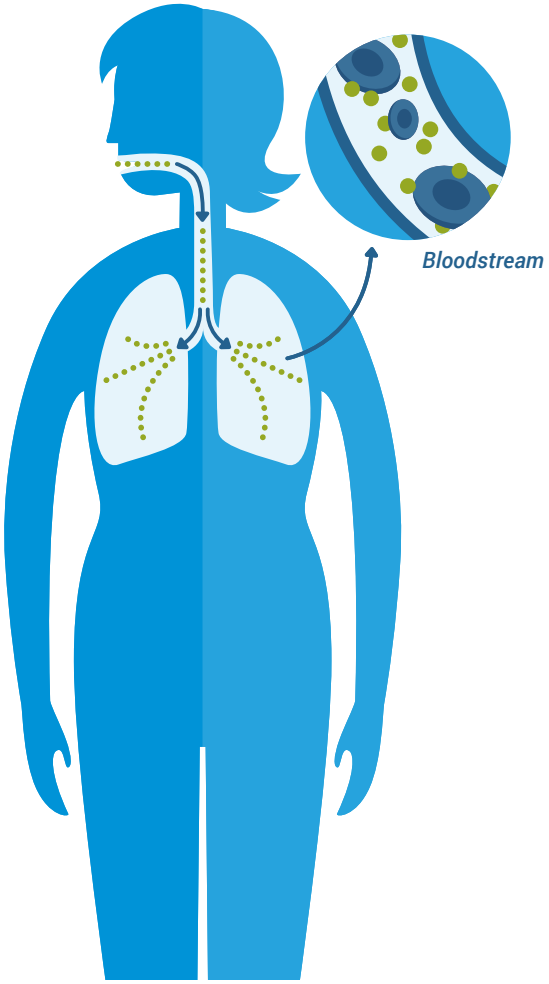
WHY DEVELOP INHALED MEDICINES?

Oral medicines enter the bloodstream through the **digestive system**, which can **delay or vary** the medicine's effect if:[3]

- the medicine's chemical structure is **broken down or modified** through "first pass" metabolism. The lungs have fewer of these metabolic enzymes compared to the liver[4]
- absorption is **slow or incomplete**
- movement through the stomach and intestines is **slow**, which can vary from person to person and can be affected by different foods or diseases



The lungs have a **large surface area** and **ample blood flow** to and from the heart, which make them an efficient gateway target for delivery of medicines to the body.[3]



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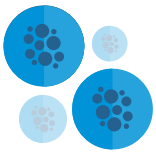
HOW IS ARCUS DIFFERENT FROM OTHER INHALATION PRODUCT PLATFORMS?

Historically, inhaled dry powder medicines:

- have been **small, dense particles combined with carrier molecules**, which were needed to prevent the particles from sticking together when inhaled[2]
- have allowed for **relatively low doses** of a medication to be delivered, up to a milligram, but usually tens of micrograms, which can be tens to thousands of times less than with non-pulmonary delivery methods[1,3]
- typically have required **inhalation devices** that rely on propellants or nebulizers, or which must be manipulated in coordination with inhalation to deliver drug adequately[2]



Standard inhaler

Nebulizer

The ARCUS platform is designed to allow significantly larger doses of drug to be delivered, up to tens of milligrams, and by an inhalation device that is powered entirely by the patient's own breath.[5]

TRANSFORMING PARTICLES WITH ARCUS

The ARCUS platform doesn't change the medicine's molecules, but rather the **size and shape** of the particles.[1]

ARCUS particles can be up to

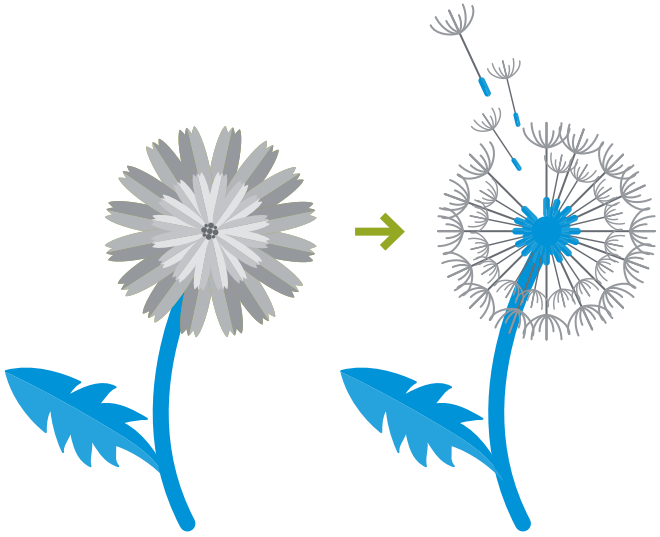
10X LARGER

than traditionally inhaled medicine particles, but have a density that is up to

90% LESS[1]

The resulting powder is designed to be **more dispersible and aerodynamically efficient** than other dry powders.[1,2]

This allows more medicine to travel **deep** into the lungs.[1]



Similar to a dandelion changing into a puff ball, ARCUS transforms medicines to make particles that are more aerodynamically efficient by changing their size and shape to help them float deep into the lungs with only the force of a normal inhalation.

The ARCUS technology continues to be explored in the development of a variety of innovative products. Visit www.acorda.com/products/arcus-technology to learn more.

1 Edwards, D.A., et al. Large Porous Particles for Pulmonary Drug Delivery. *Science*. 20 Jun 1997;276(5320):1868-1872.
2 Healy, A.M., et al. Dry powders for oral inhalation free of lactose carrier particles. *Adv Drug Deliv Rev*. 2014 Aug;75:32-52.
3 Labiris, N.R. and Dolovich, M.B. Pulmonary drug delivery. Part I: Physiological factors affecting therapeutic effectiveness of aerosolized medications. *Br J Clin Pharmacology*. 2003;56: 588-599.
4 Nishimura, M., et al. Tissue distribution of mRNA expression of human cytochrome P450 isoforms assessed by high-sensitivity real-time reverse transcription PCR. *Yakugaku Zasshi*. 2003 May;123(5):369-75.
5 Batycky R, Deaver D, Dwivedi S, et al. The development of large porous particles for inhalation drug delivery. In: Rathbone, Hadgraft, Roberts, editors. *Modified Release Drug Delivery Technology*. 2003.

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