Advanced Engineered Formulations of Simvastatin and L-Carnitine Microparticle/Nanoparticle Formulations for Inhalation Drug Delivery for Respiratory and Pulmonary Vascular Diseases and Applications Therein

**Title:** Advanced Engineering Formulations of Simvastatin and L-Carnitine Microparticle/Nanoparticle Formulations for Inhalation Drug Delivery for Respiratory and Pulmonary Vascular Diseases and Applications Therein

**Invention:** This invention is novel dry powder formulations of simvastatin and L-carnitine (separately or combined) for inhalation delivery for pulmonary vascular diseases.

**Background:** Pulmonary vascular diseases are caused by various reasons and may require combined therapies that act through difference mechanisms. Simvastatin inhibits undesired cholesterol production pathways, reducing lipid levels and allowing smoother flow through the veins, which is how it decreases pressure in the respiratory system. On the other hand, L-Carnitine plays an important role in cellular energy metabolism and is essential for mitochondrial health. Mitochondria dysfunction has been shown to play an important role in the pathogenesis of pulmonary vascular disease. Simvastatin and L-Carnitine can be placed inside excipient solutions that convey the active drug to the areas of concern. Small particle formulations like liquid or dry powder aerosols are biologically compatible, easy to inhale and then subsequently degrade. This invention provides a novel means of effectively encapsulating the active drugs for dry powder formulation.

**Application:**

- Therapeutics for pulmonary vascular diseases, for example, pulmonary hypertension.

**Advantages:**
• Small size particles allow full penetration through the pulmonary vasculature.
• Biocompatible to minimize undesired interactions and biodegradable over time.
• Novel combination of two drugs in one formulation.

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