Spray drying is an ideal one-step drying operation process to transform pumpable liquids (solutions, emulsions, slimes, pastes or even melts) into dry powders. Liquid droplets are atomised by a nozzle device and sprayed into a hot drying gas.

Spray drying offers a wide range of applications in the fields of pharmaceuticals, medicals, nutraceuticals and biotherapeutics.

Applications:
- **Powders for pulmonary therapy**: generated particle size down to 5 µm and low particle density for easy transport to the lung
- **Microencapsulation**: coating of active materials like peptides and proteins in bio-degradable polymers for easy controlled release and improved bioavailability
- **Spray dried heat sensitive vaccines**: alternative to freeze drying, powders containing more active bacterial cells

### 2. Mini Spray Dryer B-290 – Particle technology in the lab

The Mini Spray Dryer B-290 is the ideal laboratory instrument for R&D feasibility studies of APIs and its formulations into inhalable, oral or injectable drug. It offers quick and gentle drying of aqueous and organic solutions or emulsions to stable and free-flowing powders.

Features and benefits:
- Glassware enables visible spray process
- Short set-up and cleaning times
- Cleaning In Place decontamination function
- High performance cyclone separation
- Optional closed cycle with Inert Loop B-295
- Easy scale-up of the process
- Spray drying under sterile-like conditions

### 3. Application examples of spray dried pharmaceuticals

#### Lung Structure

**Diazepam microparticles**

**Spray conditions**  
- **Spray dryer**: B-290  
- Polymer concentration: 3% (w/w)  
- Drying temperature: 44 – 63 °C  
- Pump feed rate: 2 – 6 mL/min

**Results**  
- Spherical particles, 5 – 14 µm
- Drug encapsulation: 70 – 85%
- Drug release: 50 – 80% in 20 h

#### Dry Powder Inhaler

**Superoxide dismutase**

**Spray conditions**  
- **Spray dryer**: B-290  
- Inlet temperature: 51 °C  
- Outlet temperature: 34 °C  
- Pump rate: 2.5 – 4.5 mL/min

**Results**  
- Particle size: < 10 µm
- Drug encapsulation: 61%
- Drug release: 30 – 60% in 300 h

#### Tuberculosis Vaccine

**Vitamin D3**

**Spray conditions**  
- **Spray dryer**: B-290  
- Inlet temperature: 51 °C  
- Outlet temperature: 34 °C  
- Pump rate: 2.5 – 4.5 mL/min

**Results**  
- Particle size: < 10 µm
- Drug encapsulation: 61%
- Drug release: 30 – 60% in 300 h

#### Bovine Serum Albumin

**Protein**

**Spray conditions**  
- **Spray dryer**: B-290  
- Carrierzinhydroxyapatite / PLA

**Results**  
- Spherical particles with the smooth surface, 1 – 20 µm
- Size distribution, drug delivery protein without degradation

### 4. References

Visit our detailed on-line Spray Drying Application Database: [www.buchi.com](http://www.buchi.com)