BETA AGONISTS IN RESPIRATORY PHARMACOLOGY :

Mechanism of action:

Beta agonists work by binding and activating β adrenergic receptors. Successful treatment of pulmonary pathology (bronchoconstriction) with β agonists generally depends upon an agent's selectivity/activity at **$\beta_2$receptors.**

At the cellular level, agonism of $\beta_2$receptors causes **activation of the G_s protein coupled receptor**. This leads to the cytoplasmic signaling cascade which increases cAMP levels in bronchiolar smooth muscle cells, ultimately leading to **bronchodilation**.

Uses:

short acting β_2 agonists are used to treat ***acute bronchospasm***. This class of medications includes:

- Metaproterenol
- Albuterol
- Terbutaline

Long acting agonists such as **salmeterol** and **formoterol** are effective for up to 12 hours. They are used as a *prophylactic treatment for asthma*, generally in combination with an **inhaled glucocorticoids.**

Inhaled glucocorticoids and Beta agonists:

Inhaled glucocorticoids serve a very important function in the context of chronic asthma treatment because *they prevent a potentially life threatening tolerance to inhaled beta agonists.* Inappropriate use of beta agonists as monotherapy causes down regulation of β_2 receptors in the airway. *Glucocorticoids combat this by up-regulating the production of β_2 receptors* in the airway, which maintains the effectiveness of inhaled beta agonists with chronic use.

Clinical correlate: *Improperly or ineffectively educated patients that use short acting abortive inhalers (albuterol) too frequently can present to the emergency room because of this exact phenomenon. Because frequent use of beta agonists alone causes the airway to down regulate β_2 receptors, such patients can experience an asthma attack that is unresponsive to their abortive inhaler.*

Non-specific β agonist

A **non-specific β agonist** such as *isoproterenol* acts by binding and activating both β_1 and β_2 receptors. Its lack of specificity for the β_2 receptors limits its use in the treatment of bronchoconstriction. In addition, the non-specific activity of isoproterenol can cause *significant **tachycardia**(cardiac β_1 stimulation).*