**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 β₂ receptors.

At the cellular level, agonism of β₂ receptors causes **activation of the G 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 β₂ 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 β₂ receptors in the airway. **Glucocorticoids combat this by up-regulating the production of β₂ 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 β₂ 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 β₁ and β₂ receptors. Its lack of specificity for the β₂ receptors limits its use in the treatment of bronchoconstriction. In addition, the non-specific activity of isoproterenol can cause **significant tachycardia (cardiac β₁ stimulation)**.