

## 18. THREE GENERATIONS OF B-BLOCKERS: CLASS DIFFERENCES AND CLINICAL APPLICABILITY



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**Introduction:** The evolution of beta-blockers remedies has greatly influenced the management of a large scale of disorders. Research divides all beta blockers into three generations: first-generation nonselective  $\beta$ -blockers (propranolol), second generation more cardioselective  $\beta$ -blockers (nebivolol), and third generation highly selective  $\beta$ -blockers with vasodilating action (labetalol).

**Aim of study.** The aim of the study was highlighting the main differences between different generations of beta blockers.

**Methods and materials.** Articles from PubMed, NCBI, Cochrane in the period 2018-2023 regarding  $\beta$ -blockers were analyzed.

**Results.** The common mechanism of all  $\beta$ -blockers is their affinity for binding to  $\beta$ -adrenoreceptors, which reduces sympathetic nervous system activity. The differential affinity of  $\beta$ -blockers for  $\beta_1$ - over  $\beta_2$ -receptors contributes to their specificity. Propranolol was the first clinically used  $\beta$ -blocker and reduced the heart contractile strength and its rate. It was found useful in patients suffering from hypertension, angina and post-myocardial infarction, but was not suitable for patients with diabetes or with specific lung pathologies. The discovery of practolol, a second-generation drug with selectivity for  $\beta_1$ -adrenoreceptors, presents less risk of side effects associated with  $\beta_2$ -receptor antagonism. As a result of an analysis, it was confirmed that in addition to generation-dependent effects, different beta blockers have their own individual properties inherent only to a specific drug, which allows choosing the drug for various clinical situations. There are beta blockers that have a negative metabolic effect and increase the risk of developing diabetes, and there are metabolically neutral drugs (carvedilol). The mechanism of the vasodilating effect is also different, in some it occurs due to internal sympathomimetic activity (carteolol), others due to blockade of alpha-adrenergic receptors (carvedilol), betaxolol dilates blood vessels due to blockade of calcium channels, drugs such as nebivolol, dilate blood vessels by increasing the synthesis of nitric oxide. The representatives of third generation  $\beta$ -blockers can reduce peripheral vascular resistance by a decrease in oxygen demands of the heart. This includes drugs such as labetalol, the first  $\beta$ -receptor antagonist with less potency than propranolol, and nebivolol, which differs completely from the molecular structure of propranolol. Also, studies established that some  $\beta$ -blockers ameliorate endothelial and cardiac dysfunction and can be used for hypertension during pregnancy.

**Conclusion.**  $\beta$ -blockers occupy a central place in the treatment of patients suffering from cardiovascular diseases. Currently, the indications are: arterial hypertension, stable angina, previous MI, CHF, tachyarrhythmia, glaucoma and pregnancy. As first-line drugs,  $\beta$ -blockers are not recommended for use in individuals with metabolic syndrome and a high risk of developing diabetes mellitus.