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Advances in asthma management: Personalized treatment strategies and emerging biologics.

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Introduction

Asthma affects over 300 million people worldwide, with prevalence continuing to rise. Although many patients achieve control with standard therapies, a subset experiences persistent symptoms, frequent exacerbations, and reduced lung function. These cases highlight the need for more individualized approaches to treatment. Recent scientific advances have illuminated asthma's heterogeneity, prompting a shift from one-size-fits-all treatment toward precision medicine [1].

A key driver of personalized asthma care is the classification of asthma into phenotypes (observable traits) and endotypes (underlying biological mechanisms). Common phenotypes include allergic asthma, non-allergic asthma, and late-onset asthma. Meanwhile, endotypes are defined by immune pathways, such as T-helper 2 (Th2)-high or Th2-low inflammation. Identifying these subtypes is essential for selecting the most effective treatments [2].

Standard asthma therapies, including inhaled corticosteroids (ICS), long-acting beta-agonists (LABAs), and leukotriene receptor antagonists, remain the mainstay of treatment. However, these therapies are not effective for all patients, particularly those with severe or steroid-resistant asthma. The limited efficacy of these drugs in certain populations underscores the need for novel treatment options [3].

Biologic drugs have revolutionized the management of moderate to severe asthma. These therapies are designed to target specific immune molecules involved in asthma pathogenesis. Monoclonal antibodies (mAbs) such as omalizumab (anti-IgE), mepolizumab and reslizumab (anti-IL-5), benralizumab (anti-IL-5 receptor), and dupilumab (anti-IL-4 receptor alpha) have demonstrated efficacy in reducing exacerbations, improving lung function, and decreasing steroid dependence [4].

Biologics work by blocking inflammatory pathways that contribute to airway hyperresponsiveness. For instance, omalizumab inhibits IgE, which plays a central role in allergic asthma, while mepolizumab targets eosinophils through IL-5 inhibition. Clinical trials have shown significant improvements in asthma control with biologics, particularly in patients with high eosinophil counts or elevated biomarkers like FeNO (fractional exhaled nitric oxide) [5].

Conclusion

The management of asthma is entering a new era marked by precision medicine and biologic innovation. By leveraging insights into asthma phenotypes, endotypes, and biomarkers, clinicians can now offer tailored treatment strategies that significantly improve outcomes for patients with difficult-to-treat asthma. As research continues to evolve, the future promises even more refined therapies that align with individual patient needs, bringing us closer to truly personalized respiratory care.

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