Exploring Different Treatments of Asthma

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Key points:

- Symptoms
- Use of Artificial Intelligence in the treatment of Asthma
- Early diagnosis and treatment
- Use of probiotics in prevention and treatment of asthma

Symptoms

Asthma is a heterogeneous respiratory disease characterized by the chronic airway inflammation, remodeling, and airway hyper responsiveness, which is responsible for bronchial hyper-reactivity, respiratory airway narrowing and remodeling, and mucus overproduction.[2]

Common symptoms of asthma include a shortness of breath, wheezing often, chest tightness and cough which is often dry and can have harsh bursts. Cough is often a first symptom of an asthma problem. Cough most often occurs at night or early in the morning. While asthma is a chronic disease, one may not have symptoms every day. They may have days with cough, wheeze and/or shortness of breath and other days when they feel completely fine.

Asthma is usually suspected by a healthcare provider based on a pattern of symptoms and response to medicine called a bronchodilator that can relief the squeezing of the muscles around the airways. In people over 5 years of age, a breathing test using an instrument called spirometer (a pulmonary function test–PFT) helps confirm the diagnosis. This test can detect narrowing (obstruction) in the airways.
A normal breathing test result does not mean one does not have asthma. If someone has asthma, their airways are more sensitive than normal. Their airways can get irritated easily when exposed to a variety of 'triggers.' Some common triggers of asthma include allergies, respiratory infections, stress, exercise, and medications.[1]

Artificial Intelligence use in treatment

A team of researchers employed the artificial intelligence driven target discovery platform, panda Omics, to identify common targets for treating asthma, eczema, and food allergy. Thirty-two case-control comparisons were generated from 15, 11, and 6 transcriptomic datasets related to asthma (558 cases, 315 controls), eczema (441 cases, 371 controls), and food allergy (208 cases, 106 controls), respectively, and allocated into three metanalyses for target identification. Top-100 high-confidence targets and Top-100 novel targets were prioritized by Panda Omics for each allergic disease.
As a result, six common high-confidence targets (i.e., IL4R, IL5, JAK1, JAK2, JAK3, and NR3C1) across all three allergic diseases have approved drugs for treating asthma and eczema. Based on the targets' deregulated expression profiles and their mechanism of action in allergic diseases, three potential therapeutic targets were proposed. IL5 was selected as a high-confidence target due to its strong

involvement in allergies. PTAFR was identified for drug repurposing, while RNF19B was selected as a novel target for therapeutic innovation. Analysis of the deregulated pathways commonly identified across asthma, eczema, and food allergy revealed the well-characterized disease signature and novel biological processes that may underlie the pathophysiology of allergies.[3]

Early diagnosis and treatment

Another team of researchers used a case-finding method to identify adults in the community with respiratory symptoms without diagnosed lung disease. Participants who were found to have undiagnosed COPD or asthma by using spirometer were enrolled in a multicenter, randomized, controlled trial to determine whether early diagnosis and treatment reduces health care utilization for respiratory illness and improves health outcomes. Participants were assigned to receive the intervention (evaluation by a pulmonologist and an asthma–COPD educator who were instructed to initiate guideline-based care) or usual care by their primary care practitioner. The primary outcome was the annualized rate of participant initiated health care utilization for respiratory illness.

Secondary outcomes included changes from baseline to 1 year in disease-specific quality of life as assessed with the St. George Respiratory Questionnaire (SGRQ; scores range from 0 to 100, with lower scores indicating better health status).

Of 38,353 persons interviewed, 595 were found to have undiagnosed COPD or asthma and 508 underwent randomization: 253 were assigned to the intervention group and 255 to the usual-care group. The annualized rate of a primary-outcome event was lower in the intervention group than in the usual-care group (0.53 vs. 1.12 events per person-year; incidence rate ratio, 0.48; 95% confidence interval [CI], 0.36 to 0.63; P<0.001). At 12 months, the SGRQ score was lower than the baseline score by 10.2 points in the intervention group and by 6.8 points in the usual-care group (difference, −3.5 points; 95% CI, −6.0 to −0.9).[4]

Use of probiotics in prevention and treatment of asthma

Interestingly, asthmatics often demonstrate lower numbers of Lactobacillaceae bacteria, which are important for the development of regulatory T cells, and an increase in Haemophilus and Neisseria. Hence, it is possible that the appropriate use of probiotics containing Lactobacillaceae may have a beneficial effect on the micro biome and thus on asthma control. Deregulation of intestinal micro flora in early life has been repeatedly linked to the development of asthma in adults. Arietta et al. found one hundred newborns at risk of asthma to have significantly lower numbers of Veillonella, Faecalibacterium, Lachnospira, and Rothia bacteria. Another study found increased amounts of Lachnospira and Clostridium neonatal to be associated with childhood asthma. Research also indicates that patients suffering from gastrointestinal diseases are more likely to suffer from respiratory diseases, and that some bacteria present in the respiratory and gastrointestinal tract of newborns promote the maturation of the immune system and protect against the development of asthma.

Huang et al. published the results of a randomized, placebo-controlled trial on the effect of Lactobacillus Paracasei, Lactobacillus Fermentum and a combination of both strains, on the severity of asthma in children, and on markers of the immune system. The study included 152 patients with sporadic or moderate asthma. The participants received probiotics for three months. The severity of the disease decreased after therapy in all probiotic groups. Additionally, in children taking both probiotics, PEF values improved significantly. Also, this group demonstrated a significant reduction in blood IgE concentration. The probiotic groups demonstrated lower stool Clostridium bacteria content compared to placebo, although the difference was statistically insignificant. In all groups receiving the bacteria, childhood asthma control test (C-ACT) values increased and asthma improved. The described clinical trial confirmed that both strains can reduce the severity of asthma in children, regardless of the additional drugs used, and the effects were most pronounced when given in combination. This may be due to the fact that the micro biome varies between individuals, and perhaps the use of two similar, beneficial strains increases the chance that at least one of them will adapt to the micro flora of a specific patient and modulate it.

The dynamic growth of interest in probiotics and their therapeutic potential in asthma is best illustrated by the growing amount of scientific publications on this topic. Studies examined the traditional oral administration and more innovative intranasal or even intratracheal administration of probiotic microorganisms. Most published results are based on animal models of allergic asthma. It has been demonstrated that selected probiotic bacteria exhibit anti-inflammatory activity and may have a beneficial effect on AHR. Probiotics reduce the concentration of IgE in the blood, limit the infiltration of eosinophils in the airway and restore Th1/Th2 cellular balance. In addition, the administration of L. bulgaricus or L. rhamnosus results in a reduction in airway mucus secretion, which may translate into improved patient well-being in clinical practice. Intranasal application of bacteria may contribute to a more effective stimulation of the processes taking place in the lymph nodes, but it may result in a potential excessive distribution of bacteria in the body.[5]

References

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