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Allergic respiratory diseases in season and out of pollen season – prevention and treatment

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Introduction: Allergic respiratory diseases are common disorders that diminish quality of life in affected subjects and have a significant economic impact. Therefore, the prevention and management of these diseases require worldwide efforts. Asthma and allergic rhinitis frequently coexist and several data suggest 'one-airway' concept.

Methods: PubMed search using the terms: allergic rhinitis, asthma, Allergic Rhinitis and its Impact on Asthma (ARIA), Global Initiative for Asthma (GINA) guidelines, as well as personal knowledge of the authors based on a comprehensive literature review.

Results: Avoiding the exposure to allergens, e.g. pollen in affected subjects, has a significant effect on reducing symptoms. However, other unspecific and not sensitizing, but irritating factors, including high humidity, temperature changes, and air pollution, particularly the environmental tobacco smoke, may exacerbate respiratory tract symptoms in parallel with pollen, as well as cause the clinical symptoms out of the pollen season. Changes in the weather, such as rain or humidity, may induce hydration of pollen grains, followed by their fragmentation, which leads to the generation of the atmospheric biological aerosol with low-molecular and very sensitizing particles that penetrate deeply into the airways. Therefore, thunderstorms can be associated with allergic asthma outbreaks in patients suffering from pollen allergy. The same has been demonstrated for the traffic-related fumes from diesel engines. The climate change through increased atmospheric temperature, humidity, concentration of fungal spores, and earlier start with longer duration of the pollen season, may further increase the risk of allergies, but evidences are still limited.

The treatment of the upper airway allergic disease includes saline nasal rinses that remove allergens, decongestants, oral antihistamines, corticosteroid, antihistamine and anticholinergic nasal sprays, leukotriene antagonists, and immunotherapy. Glucocorticoid nasal sprays are presently the most effective single-agent maintenance therapy for allergic rhinitis. The newer formulations, such as fluticasone propionate, mometasone furoate, and fluticasone furoate, have minimal systemic bioavailability. In patients with mild symptoms, who prefer other medications, an antihistamine or cromolyn nasal spray, as well as oral antihistamine might be an option. The lower airway pharmacologic management includes the use of relief and control agents. Control agents include inhaled corticosteroids, long-acting bronchodilators (beta-agonists and anticholinergics), theophylline, leukotriene modifiers, anti-immunoglobulin E and anti-interleukin 5 antibodies. A group of relief medications consists of short-acting bronchodilators, systemic corticosteroids, and ipratropium. Subcutaneous and sublingual immunotherapy have proven the efficacy in allergic rhinoconjunctivitis and asthma. Emerging data demonstrated a beneficial effect of probiotics in the treatment of allergic diseases, including respiratory tract symptoms. Some studies indicated also that the diet with a high content of anti-oxidants is promising to reduce susceptibility to air pollution.

Conclusions: Allergic rhinitis and asthma are inflammatory disorders that have been related epidemiologically, pathophysiologically and clinically. The appropriate prevention and treatment might improve patients' quality of life and work productivity. ARIA and GINA recommendations support clinicians in choosing the optimal treatment.

Pollen or allergen monitoring? Useful information about the varying exposure during the pollen season

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For many decades, pollen grains and fungal spores have been considered as a proxy for allergen exposure. The last findings showed however that this assumption should be treated with the extreme caution. The amount of allergenic proteins released from pollen grains and spores (so called potency or allergenicity) can markedly vary depending on various spatiotemporal and ecophysiological factors. The highest, even 10-fold, differences were observed with relation to daily variation in the pollen grain potency. The location is also important, as it was showed for grasses and olive pollen collected in different parts of Europe. For instance, the allergenicity of grass pollen in UK was 2-3 times higher than in Finland, indicating the role of the species distribution and geoclimatic adaptation in modulating the allergenicity of pollen. The species-specific differences in the pollen allergenicity have also been observed with relation to the different mugwort species. The allergenicity of pollen and spores may also change in response to various environmental factors, such as weather conditions and pollution. Birch trees growing in higher temperature produce pollen with the higher content of Bet v 1, while the bioavailability of grass pollen allergens may be modulated by air pollutants, specifically SO_2 and NO_2. In addition, the causal relationship between bacterial diversity and birch pollen allergenicity have also been suggested.

It should be also stressed, that pollen grains and fungal spores are not the only allergenic particles detected in the air. Much smaller (often less than 1μm) pollen-derived particles, e.g. starch granules or pollensomes, have also been observed. Due to their small size they are able to penetrate into deeper levels of the respiratory tract, which in turn can induce asthmatic reactions. The concentration of these respirable particles in the air increases with increasing humidity, e.g. after light rain. Importantly, there is the evidence that also during thunderstorms pollen grains may release into the atmosphere the paucimicronic particles causing a rapid increase in the emergency hospital admission for asthma. The role of fungal fragments in thunderstorm-associated asthma is also investigated. It should be emphasized that fungal particles different from intact spores, like mycelium fragments, also contain allergens. These fragments are particles derived from any intracellular or extracellular fungal structure, and their number in the air seems to be higher than the number of intact spores.

Undoubtedly, the traditional aerobiological monitoring supplies important and very useful information about the varying concentrations of pollen and spore in the air. However, as it was mentioned above, more and more evidences suggest that the traditional monitoring should be completed with quantitative allergen analysis. Such a synergic approach is crucial to estimate sufficiently the health risk caused by airborne fungal and pollen allergens.

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Ragweed sensitization in allergic patients in the Western and Central parts of Ukraine: diagnosis and efficacy of sublingual immunotherapy

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Introduction: Allergy to weeds pollen is considered to be the late wave of hay fever, which usually begins in the second half of summer (end of July to August) and lasts until the first frost. However, today these data are relative due to the global warming and environmental pollution, which greatly affect the terms and duration of the weeds pollen spreading, changes of the antigenic structure of pollen. The most important causes of hay fever were pollen of mugwort and ragweed. The pollen of *Ambrosia* produced in enormous amounts and one single plant alone may produce millions of pollen grains. Since the pollen grains are small (18-22 nm) they are often involved in episodes of the long distance transport. The prevalence of *Ambrosia artemisiifolia* on the territory of Ukraine had started in 60-70-th years of the last century from Crimea. Nowdays *Ambrosia* is registered in 23-24 regions of Ukraine including the Central part, the collecting area are 1 328 377.863 hectares. In Western Ukraine it appeared more than 20 years ago and its area is increasing quickly. Therefore, according to our observation, latent sensitization to the pollen of *Ambrosia artemisiifolia* is increasingly detected in patients in the western regions of Ukraine. Instead, the development of molecular diagnostics today makes it possible to clearly identify the major allergen of *Ambrosia* and, to offer the patient a personalized choice of the allergic immunotherapy (AIT) with a prediction of its efficacy. The aim of this study: to compare the features of sensitization to *Ambrosia* in patients in Lviv (Western Ukraine) and Kyiv regions (Central Ukraine) and to analyze the efficacy of AIT with Extract of Ambrosia (Diater Laboratories, Spain).

Methods: The group of 586 patients aged 5-58 were examined in Kyiv 327 (55.8%) and 259 (44.2%) in Lviv region. SPT was performed by Extract "Ambrosia". The patients were examined to undergo molecular diagnostics using ImunoCAP (Phadia) to identify major (n Amb a 1) allergen. The SLIT was carried out with a mixture of *Ambrosia*.

Results: The prevalence of the *Ambrosia* sensitization was diagnosed in 25 (9.6%) persons in the Lviv region. 3 (12.0%) children moved from the Crimea and 22 (88.0%) adults were born and have been living in Western Ukraine. Sensitization to *Ambrosia* major allergen (nAmb a 1) was detected in 23 (92.0%) persons. Withal, sensitization to *Ambrosia* (SPT) in patients in the Kyiv region was determined 2.5 times higher: positive SPT was detected in 80 (24.5%) patients, 28 (35.0%) children and 52 (65.0%) adults). The true sensitization has been confirmed in 88.0% of people. SLIT was prescribed in the patients in both regions. The efficacy of SLIT was assessed by a visual analogue scale (VAS-up). An assessment of SLIT showed that there was a significant decrease in the severity of symptoms in the studied groups after 2 years of treatment (94.1% and 94.5%, respectively).

Conclusions: A high level of sensitization to major allergen (n Amb a1) of *Ambrosia* in children and adults in Ukraine leads to a significant increase in allergic pathology. High efficacy of the SLIT provides the possibility of the relative control of the prevalence of severe form of allergic diseases.

Experience of allergen immunotherapy in children with IgE-related seasonal allergic rhinitis

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Introduction: According to international recommendations, EAACI allergen-specific immunotherapy (AIT) is the most effective, modern, pathogenetic method of the treatment of the allergic pathology in children with their causative allergens. To analyze the spectrum of causative allergens in the development of IgE- related seasonal allergic rhinitis (AR) in children and the efficacy of the treatment after AIT.

Materials and methods: This investigation was performed at the Department of Clinical Immunology and Allergology of Danylo Halytsky Lviv National Medical University and in the regional children's pulmonary and the allergological department of LRCCH "OKHMATDYT". Totally, 28 individuals, 9±4.6 years old, male 19 (67.8%), female 9 (32.2%) were examined. Clinical diagnosis of AR was made according to ARIA criteria (2014). At time of selection, patients' allergy symptoms were evaluated and analysis of the case history was done. There were determined: total laboratory, instrumental and specific immunological investigations, SPT to standard inhaled allergens («Immunolog», Ukraine), total serum and specific IgE, ELISA, type-specific components of allergens, immunofluorescent method immunoCAP ("Phadia AB", Swiss). Patients received a two-year course of immunotherapy using sublingual allergens (SLIT), Diater, Spain.

Results: Among 28 individuals we found: 20 children – AR was associated with allergic conjunctivitis (71.0%), 7 children – AR (25.0%), one child – AR with bronchial asthma (5.0%). All children had high level of total and specific IgE. The most commonly detected positive SPT were to: *Timothy grass* pollen 21 (75.0%), to *Artemisia* pollen 4 (14.0%), *Betula* pollen 2 (7.0%), *Alternaria alternata* 1 (5.0%). The SLIT was carried out for 28 children with pollen allergy. After the course of SLIT we got: total IgE and specific IgE decreased in 75.0% of children; facilitated the progress of allergic pathology in all children. Besides, in 34.0% of children the steady clinical remission of allergic pathology after repeated (2^{nd} year) courses of SLIT was revealed.

Conclusions: The etiological factor of the pollen allergy in children was pollen of *Timothy grass*. The use of SLIT facilitates the progression of allergic diseases, reduces the frequency of their exacerbations, reduces the need for the use of pharmtreatment. Conducting repeated courses of SLIT leads to sustained clinical remission of pollen allergy in children.