

World Allergy Organization Guidelines for Prevention of Allergy and Allergic Asthma

Condensed Version

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Introduction

The prevalence of asthma and allergy is increasing. It is estimated that over 20% of the world population suffers from IgE-mediated allergic diseases, such as asthma, rhinoconjunctivitis, eczema and anaphylaxis. Asthma, which in more than 50% of adults and in at least 80% of affected children is allergic, occurs in around 5–15% in the paediatric population. Asthma is estimated by the World Health Organization (WHO) to affect 150 million people worldwide, placing an enormous strain on health resources in many countries, and is a major cause of hospitalisations for chronic diseases in children in the western world.

Prevention of Allergy and Allergic Asthma was a collaborative project between the World Allergy Organization-IAACI (WAO) and the World Health Organization [1, 2]. This document is a condensed version of the full Prevention of Allergy and Allergic Asthma Report [3].

The strategic guidelines in this document have been developed to provide a sound basis for practical action to be taken by governments, health care professionals, lay organizations, and patients.

In the westernized world, allergy and asthma have increased two- to threefold over the last forty years and have reached epidemic proportions. The increase in these

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diseases has occurred over a period of persistent environmental and lifestyle changes. Epidemiological studies have shown great variation in the prevalence of asthma and allergies between different nations. Valuable information may be derived from areas where a rapid increase in disease has occurred, to form the basis for prevention strategies in areas where the prevalence of these diseases is still low.

The strategic guidelines in this document have been developed to provide a sound basis for practical action to be taken by governments, health care professionals, lay organizations, and patients at a national level. Much of the research on which the guidelines are based has been conducted in countries that have experienced this rapid increase in allergies and asthma, and so will require interpretation and adaptation to meet different local circumstances. Within any country, climatic and environmental variations, and differences between affluent and non-affluent groups, may require a broad range of strategies and advice to be available. It is hoped that the general principles of prevention proposed in this document will provide a useful basis for local guidelines to be developed. Further actions are recommended in each section to assist the strategic development of national and international research programs.

This document focuses mainly on primary prevention of the allergen-specific immunological sensitization that is the basis for allergy and for much of asthma. Primary prevention measures should be implemented if they meet the following criteria:

- they should be of potential benefit to the major part of the population
- they should be of no known harm to anyone
- they should not involve unreasonable costs.

Secondary prevention is also covered in some detail since adequate diagnosis and treatment of allergic diseases such as eczema and allergic rhinitis at a young age can prevent the later development of asthma.

Tertiary prevention is briefly mentioned; it is covered in detail elsewhere, for example in the Global Resources in Allergy (GLORIA) program of WAO, the Global Initiative for Asthma (GINA) document [4] and the Allergic Rhinitis – its Impact on Asthma (ARIA) [5] document.

Non-allergic asthma is mentioned in this report since some secondary prevention strategies may be of value in this disorder. Although the causes are less well defined, similar inflammation is present in the airways of patients with non-allergic asthma as in allergic asthmatics.

Evidence Base

In creating the full Prevention of Allergy and Allergic Asthma document, authors were asked to code referenced documents in accordance with the WHO Categories of Evidence. On the basis of the categorization of evidence, a strength of recommendation may be awarded to the ensuing guidelines. The Categories of Evidence are more easily applied to therapeutic interventions than to epidemiological and basic research studies, where randomization or blinding may not be possible. It may not be possible, for example to code a well-designed physiological study by these criteria. Thus, a recommendation awarded a 'b' cannot always be interpreted as a lesser recommendation than one coded 'a' – it is an indication only of the type of studies which have created the evidence base; a recommendation awarded 'd' means only that at the present time there is an absence of evidence. Strength of recommendation categories have been restricted to the guidelines on Preventive Measures and Education, where a clear interpretation of the evidence base is possible.

WHO Categories of Evidence

- Ia Evidence from meta-analysis of randomised controlled trials
- Ib Evidence from at least one randomised controlled trial
- IIa Evidence from at least one controlled study without randomisation
- IIb Evidence from at least one other type of quasi-experimental study
- III Evidence from non-experimental descriptive studies, such as comparative studies, correlation studies and case-control studies
- IV Expert opinion of the PAAA working group

WHO Strength of Recommendations

- A Directly based on category I evidence
- B Directly based on category II evidence or extrapolated recommendation from category I evidence
- C Directly based on category III evidence or extrapolated recommendation from category I or II evidence
- D Directly based on category IV evidence or extrapolated recommendation from category I, II or III evidence

Glossary and Definitions

The terminology proposed by the European Academy of Allergology and Clinical Immunology publication, *A Revised Nomenclature for Allergy* [6] has been updated by WAO in its publication *A Revised Nomenclature for Allergy for Global Use* [7]. The WAO nomenclature is used throughout this document.

Allergy is a hypersensitivity reaction initiated by immunological mechanisms. Allergy can be antibody- or cell-mediated. In the majority of cases the antibody typically responsible for an allergic reaction belongs to the IgE isotype and these individuals may be referred to as suffering from an IgE-mediated allergy. Not all IgE-mediated allergic reactions occur in 'atopic' subjects. In non-IgE-mediated allergy the antibody can belong to the IgG isotype, e.g. anaphylaxis due to immune complexes containing dextran, and the classical, nowadays rare, serum sickness previously referred to as a Type II reaction. Both IgE and IgG antibodies are found in allergic bronchial pulmonary aspergillosis (ABPA). Allergic contact dermatitis is representative of allergic diseases mediated by lymphocytes.

Allergens are antigens which cause allergy. Most allergens reacting with IgE and IgG antibody are proteins, often with carbohydrate side chains, but in certain circumstances pure carbohydrates have been postulated to be allergens. In rare instances low molecular weight chemicals, e.g., isocyanates and anhydrides acting as haptens, are still referred to as allergens for IgE antibodies. In the case of allergic contact dermatitis, the classical allergens are low molecular weight chemicals, e.g., chromium, nickel and formaldehyde, reacting with T cells.

Atopy is a personal and/or familial tendency, usually in childhood or adolescence, to become sensitized and produce IgE antibodies in response to ordinary exposure to allergens, usually proteins. As a consequence, such individuals can develop typical symptoms of asthma, rhinoconjunctivitis, or eczema. The terms 'atopy' and 'atopic' should be reserved to describe the genetic predisposition to become IgE-sensitized to allergens commonly occurring in the environment and to which everyone is exposed but to which the majority do not produce a prolonged IgE antibody response. Thus, atopy is a clinical definition of an IgE antibody high-responder. The term atopy cannot be used until an IgE-sensitization has been documented by IgE antibodies in serum or by a positive skin prick test. Allergic symptoms in a typical atopic individual can be referred to as atopic, e.g., atopic asthma. However IgE-mediated asthma in general should not be called atopic

asthma. Neither a positive skin prick test nor presence of IgE antibody to a less common allergen, e.g. Hymenoptera stinging or a drug, which are high dose exposures, is a diagnostic criterion for atopy.

Hypersensitivity causes objectively reproducible symptoms or signs, initiated by exposure to a defined stimulus that is tolerated by normal subjects.

Prevention

Primary Prevention: prevention of immunological sensitization (i.e., the development of IgE antibodies)

Secondary Prevention: preventing the development of an allergic disease following sensitization (and the progression from eczema or rhinoconjunctivitis into severe diseases such as asthma)

Tertiary Prevention: treatment of asthma and allergic diseases

Disease Nomenclature

Asthma (as defined by GINA) is a chronic inflammatory disorder of the airways in which many cells play a role, in particular mast cells, eosinophils and T-lymphocytes. In susceptible individuals this inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness, and cough particularly at night and/or in the early morning. These symptoms are usually associated with widespread but variable airflow limitation that is at least partly reversible either spontaneously or with treatment. This inflammation also causes an associated increase in airway responsiveness to a variety of stimuli.

Occupational asthma is characterized by variable airflow limitation and/or airways hyperresponsiveness due to causes and conditions attributable to a particular occupational environment and not to stimuli encountered outside the workplace.

Allergic Asthma is the basic term for asthma mediated by immunological mechanisms. When there is evidence of IgE-mediated mechanisms the term IgE-mediated asthma is recommended. IgE antibodies can initiate both an immediate and a late asthmatic reaction. However, as in other allergic disorders, T-cell associated reactions seem to be of importance in the late and delayed reactions. Depending on duration of symptoms, asthma can be referred to as either intermittent or persistent (as recommended in the Allergic Rhinitis – Its Impact on Asthma (ARIA) document [5]).

Non-Allergic Asthma is the preferred term for non-immunological types of asthma. It is recommended that

the old terminologies, 'extrinsic', 'intrinsic', 'exogenous' and 'endogenous' should no longer be used to differentiate between the allergic and non-allergic sub-groups of asthma.

Rhinoconjunctivitis: Symptoms of an immunologically-mediated hypersensitivity reaction in the nose and conjunctiva should be referred to as allergic rhinoconjunctivitis. Most cases are IgE-mediated. Based on duration of symptoms, it can be useful to differentiate between intermittent and persistent allergic rhinoconjunctivitis, as described in the document Allergic Rhinitis – its Impact on Asthma (ARIA) [5].

Dermatitis: The umbrella term for a local inflammation of the skin should be dermatitis. What is generally known as 'atopic eczema/dermatitis' is not one, single disease but rather an aggregation of several diseases with certain characteristics in common. A more appropriate term is eczema. The subgroup related to allergic asthma and rhinoconjunctivitis, i.e. eczema in a person of the atopic constitution, should be called atopic eczema.

Close contact with low-molecular-weight chemicals may provoke a predominantly Th1 lymphocyte-mediated allergic contact dermatitis. The non-allergic variety can also be described by terms like irritant/toxic contact dermatitis.

Genetics

At present, no genetic markers for IgE-sensitization are known. Genes involved in the pathogenesis of allergy, and of asthma in general, have not been identified with certainty, although potential candidate genes have been defined. No firm practical recommendations to physicians or patients can yet be made from the results of genetic studies, but may be possible in the future.

Current Knowledge

- The atopic constitution is a major risk factor for the development of IgE-sensitization.
- Individuals with a family history of atopy have an increased risk of developing allergic diseases such as allergic asthma, allergic rhinitis or atopic eczema.
- The risk of developing allergic disease in a particular organ is related to family history of that disease.
- Contribution of genetic factors to the development of IgE-sensitization, and to family history of an IgE-mediated disease, is between 70–80%.

Further Actions Required

Identification of genetic variants that predispose to allergic disease may result in several outcomes:

- Early identification of susceptible individuals would allow them to be targeted at early age to prevent IgE-sensitization, and for avoidance of allergen exposure. Genetic screening in early life may become useful in preventing allergic disease.
- Identification of environmental factors that interact with susceptibility genes to trigger allergic disease and the periods of life in which this occurs, may give opportunities for environmental modification.
- Understanding susceptibility factors will help to find new drugs to treat and prevent allergic diseases. Genetic variants influence response to therapy, and their identification will improve the efficacy of therapeutic measures.

Is the atopic constitution heritable?

- Individuals with a family history of atopy have an increased risk of developing IgE-sensitization.
- The risk of developing IgE antibody-mediated diseases (asthma, rhinitis, eczema) is related to family history of such disease.
- Studies have estimated the contribution of genetic factors to the development of IgE-sensitization, and to family history of an IgE-mediated disease, at between 70 and 80%.

Environmental Influences

Environmental factors initiate and aggravate allergic diseases and asthma. It was initially thought that early infections increased the risk of allergic symptoms. However, by the late 1980's the 'hygiene hypothesis' proposed that infections may prevent, rather than cause, allergic diseases, though their role is still not fully understood. In the early 1980's outdoor air pollution was related to troublesome asthma and also considered as a possible cause of the increasing asthma incidence. Although outdoor air pollution may aggravate established asthma, it has not been shown to increase the incidence.

Research has moved from the study of factors that aggravate allergies and asthma, and examination of risk factors within populations, to studying differences between populations that might explain the development of these conditions. The majority of studies come from

developed countries, where rates of asthma and allergic disease are generally higher than in developing countries. Studies such as the International Study of Asthma and Allergies in Childhood (ISAAC) will continue to bring important information from places where these conditions are rising in prevalence as life-style and environments change.

Current Knowledge

- Cigarette smoking in pregnancy deteriorates fetal lung development and increases the risk of wheezing in infancy.
- Environmental tobacco smoke causes wheezing in infants and aggravates asthma. All children benefit through avoidance of environmental tobacco smoke.
- Avoidance of allergen exposure has only partially been successful in prevention of IgE-sensitization. Avoidance is difficult to implement, benefits are small, and long-term effects doubtful.
- Infants at high allergy risk (allergic disease in atopic parents or siblings) may benefit through avoidance of pets and dust mite during the first year of life.
- Some respiratory infections in early childhood, e.g. pertussis and RSV bronchiolitis may enhance IgE sensitization and possibly allergic diseases.
- Relative lack of early microbial exposure, particularly early in life, may enhance the development of allergic diseases, but further research is needed in this field.

Further Actions Required

Study priorities in allergy related environmental issues are:

- Exploration of the environmental factors associated with residence in high versus low prevalence-of-allergy locations.
- Effect of modulating the diet of pregnant and breast-feeding mothers (including increased intake of vegetables, fruit, cereals, nuts, starches and fish).
- Effect of allergen avoidance in primary and secondary prevention, and in the treatment of allergic diseases (tertiary prevention).
- Protective effect of allergen exposure in the first year of life.
- Effect of indoor air as well as ambient air pollutants (e.g. NO_x, ozone, fine particulates) in the development of allergic diseases and their aggravation.

Early Immunological Influences

Current Knowledge

- Allergen-specific T-helper cell programming is initiated very early in life and in many cases consolidates into the adult pattern during the pre-school years. This programming process is directly driven by exposure to dietary and inhalant allergens that are ubiquitous in the environment.
- Early exposure to high levels of dietary allergens commonly results in high zone tolerance, whereas exposure to inhalant allergens is usually insufficiently intense to trigger this mechanism (evidence mainly from animal studies).
- Exposure to low levels of inhalant allergens seems to trigger low zone tolerance mechanisms resulting in either weak Th1-like immunity, or Th2 polarised responses, which may be further modified by other regulatory mechanisms. Resistance to allergic sensitisation post-natally requires maturation of Th1 function, which is normally driven by contact with microbial signals that are absent from the fetal environment.

Further Actions Required

Study priorities are:

- Safe intervention strategies for infants at high allergy risk. As allergic manifestations are also increasingly common in children without family history of allergy, there is a need for easy-to-implement guidelines for all infants. Allergic diseases are difficult to modify once established.
- Role of nutritional factors in infants in development of the immune and respiratory system.
- Possibilities to induce postnatal high zone tolerance to inhalant allergens by administering high doses of allergens.
- Inhibition of Th2 function during the early stages of allergy development by new antagonists (against IgE, IL-4, IL-12 etc) administered alone or in combination with allergen specific immunotherapy (ASIT).
- Mechanisms underlying interactions between respiratory allergy and respiratory infections during infancy, in relation to long term asthma outcomes.
- Efficacy of anti-viral agents in treatment of RSV bronchiolitis and prevention of asthma in young children at high risk.

Predictive and Early Diagnosis

Symptoms of the upper or lower airways related to IgE-sensitization are not detectable at birth, and rarely develop during the first two years of life. In many cases airways symptoms are preceded by eczema, which has the highest incidence during the first three months of life and reaches the highest prevalence during the third year of life. The atopic eczema usually presents in children with a positive family history of atopy and allergic asthma or allergic rhinoconjunctivitis, and is considered a prodromal state of later allergic respiratory allergy. Episodic wheezing is frequently observed in children from infancy onwards; in the majority of cases it is transient and does not result in persistent disease. A range of co-factors, both host and environmental, are involved in IgE-mediated diseases such as asthma; only a subset of school age children with signs of IgE-sensitization develop allergic disease.

A pre-requisite for secondary prevention is a correct diagnosis of individuals who have developed IgE-sensitization. IgE antibody should be measured in the serum by an appropriate immunoassay or indicated in the skin by the skin prick test, using standardized allergen extracts. In specialist clinics, target organ reactivity can be determined by challenge tests, e.g., nasal, conjunctival and bronchial allergen challenge.

While we lack confirmed genetic and immunologic markers, primary prevention of IgE-sensitization is difficult to achieve.

Current Knowledge

- Family history, taken by an experienced clinician, is the most reliable predictor of development of allergy and asthma in infants. If both parents have allergic asthma, allergic rhinoconjunctivitis, or atopic eczema, the child has a four-fold risk to develop allergies compared with a child whose parents do not have allergies. If only one parent has allergic disease, the risk is two-fold.
- Early signs of an allergic disease, especially the atopic eczema, and presence of IgE antibodies specific to inhalant allergens, are important risk factors for later respiratory allergy. IgE antibodies in infant serum to basic food proteins, e.g. hen's egg may predict the so-called allergic march.
- Current immunological markers obtained during the neonatal period are not specific or sensitive enough to predict allergic disease. High IgE concentration in cord blood or infant serum is specific for subsequent allergic

disease but has a low sensitivity, and measuring total IgE is not recommended for screening.

Further Actions Required

- Mechanisms of initial IgE-sensitization should be explored to develop markers necessary for early prediction.

Preventive Measures

Risk factors associated with asthma have been partially identified. Evidence is most complete for indoor allergens, particularly for house dust mites. Preventive measures to reduce mite exposure and other focused intervention strategies are appropriate for those at high risk. Tobacco smoke is a known risk factor for childhood respiratory disease, and for occupational sensitization.

Guidelines

Primary prevention

- Avoid smoking and exposure to environmental tobacco smoke, particularly during pregnancy and early childhood (B). Tobacco smoke should be also removed from work places (B).
- Avoid damp housing conditions (C), and reduce indoor air pollutants (C).
- Breast-feed exclusively until 4–6 months (B)¹. No special diet for the lactating mother (A).
- Reduce exposure to inhalant allergens in young children at high risk (dust mites, cockroaches, furred pets) (B).
- Eliminate sensitizing and highly irritating agents in occupational environments (C). If this is not possible, implement measures to prevent employee exposure.

Secondary Prevention

- Treat atopic eczema in infants and children to try to prevent respiratory allergy (D).
- Treat upper airways disease (rhinoconjunctivitis) to reduce risk of development of asthma (D).
- In young children already sensitized to house dust mites, pets or cockroaches, exposure should be reduced to prevent onset of allergic disease (B).

¹ Based on allergy prevention studies exclusively breast-feeding and avoidance of solid foods at least 4 months seems to be effective. WHO dietary guidelines recommend exclusively breast-feeding for 6 months in general. Infants who are not breast-fed because their mothers are HIV positive, and who have consequently developed allergy to cow's milk, should receive hypoallergenic formula, if available, to improve symptom control (B).

- Remove employees from occupational exposure if they have developed symptoms caused by occupational allergic sensitization (C).

Tertiary Prevention

- Infants with cow's milk allergy should avoid cow's milk proteins; if a supplement is needed, use hypoallergenic formula, if available/affordable, to improve symptom control (B).
- Patients with asthma, rhinoconjunctivitis or eczema, who are allergic to indoor allergens such as dust mites, cockroaches and animal danders, should eliminate or reduce the exposure to improve symptom control and prevent exacerbations (A–B).
- Aim pharmacotherapy primarily towards the underlying inflammatory process (A).
- Avoid strictly acetyl salicylic acid or other non-steroidal anti-inflammatory drugs (NSAIDs) in patients who have been diagnosed as being sensitive to them (C).

Allergen avoidance advice sheets are provided in Appendix 1.

Further Actions Required

Study priorities are:

- Detection of potent allergens in marketed ready-made foods (also hidden allergens); declaration of the food allergen content should be improved.
- Effect of human milk, and the role of milk constituents (e.g. n3/n6 fatty acids, alpha-linolenic acid, cytokines etc.) in the development of sensitization and clinical manifestations of allergy.
- Effect of dietary factors in the development of allergy and asthma, e.g. salt intake, antioxidants and n3/n6 fatty acids.
- Effect of intestinal microbial flora, antibiotics, pro- and pre-biotics, and microbial vaccinations in the development of sensitization and clinical manifestations of allergy.
- Effect of low-allergen domestic environments in sensitized children and in patients with allergic diseases. Environmental measures should be studied in terms of clinical benefit, feasibility, compliance, cost, and the interventions should be of adequate length, e.g. 12 months.
- Effect of dust mite avoidance on allergic symptoms, exacerbation rates, need for medication and health costs.
- Role of indoor air and ambient air pollutants in the development of sensitization and clinical manifestations of allergy.

Further Actions for Occupational Allergies

- Risks of occupational allergy should be monitored and epidemiological information collected by a globally agreed questionnaire.
- High risk for allergy environments should be identified (e.g., enzymes, flours, latex, animals). In atopic employees who work in these environments, detection of sensitization by skin prick tests or IgE antibody measurements could prevent the development of clinical allergy.
- General principles of prevention of occupational asthma, rhinoconjunctivitis and dermatitis (hand eczema, contact dermatitis) should be published by national regulatory and advisory bodies.

Education

Patient education programs in allergic disease and asthma have proven value in optimizing disease control and are cost-effective. The resulting increase in drug costs observed in some asthma studies, especially in low-income populations, and in the number of physician visits, are usually outweighed by the reduction in emergency visits and hospitalizations.

Guidelines

- Patient education regarding precipitants of allergic symptoms, asthma, and anaphylaxis is essential. Guided self-management to prevent, assess and treat symptoms is the key to optimizing disease control (A).
- School policies on asthma and anaphylaxis management are essential (D).

Further Actions Required

Initiation of an International Coalition for Allergy and Asthma Prevention. The aims are:

- To collect effective programs into a database for all countries.
- To establish an annual Convention on allergy and asthma prevention, education and applied research for medical professionals from participating countries.
- To establish an International Allergy and Asthma Prevention & Education Promotion Fund, supported by public and private funding.
- To determine criteria to distribute funds as: (1) seed money to initiate program activities, and (2) matching funds to supplement the available funding.

- To determine the criteria for membership of the International Coalition as an Allergy and Asthma Preventing & Education Promoting Country.

Recommended topics for inclusion in patient education programs are shown in Appendix 2.

Costs of Allergies and Asthma

Asthma and other allergic diseases represent health conditions from which millions suffer physical impairments, reductions in quality of life, and economic impact. Prevention will lead to more effective use of health care resources.

The cost of asthma in the USA in the late 1990's was 12.7 billion dollars; the indirect costs for allergic rhinitis accounted for an additional 1.2–7 billion dollars annually and 36 million physician visits. In Australia, 1 million days are missed from school each year due to asthma. There is evidence that the costs are increasing, and are switching from hospital costs to medication costs. The economic impact of allergic diseases in developing countries with large populations, such as India, Indonesia, China, has not been quantified.

Guideline

- When considering any intervention for prevention or treatment, take into account not only the evidence showing the beneficial effect of a certain product or measure but also the costs. Use the most cost-effective product or measure.

Further Actions Required

Study priorities are:

- Health economic impact of asthma, rhinitis and eczema and the conditions together, especially in terms of indirect costs.
- Societal costs of allergy and asthma in developing countries, and the development of these costs.
- Health economic evaluations in all controlled studies exploring early treatment of allergic disease, especially asthma.
- Health economic impact of measures taken to control environmental exposure compared with medication management in prevention and treatment of allergies and asthma.
- Development of more advanced models to study health economic impact of allergic diseases.

Summary of Guidelines

Primary Prevention

- Avoid smoking and exposure to environmental tobacco smoke, particularly during pregnancy and early childhood (B). Tobacco smoke should be also removed from work places (B).
- Avoid damp housing conditions (C), and reduce indoor air pollutants (C).
- Breast-feed exclusively until 4–6 months (B)². No special diet for the lactating mother (A).
- Reduce exposure to inhalant allergens in young children at high risk (dust mites, cockroaches, furred pets) (B).
- Eliminate sensitizing and highly irritating agents in occupational environments (C). If this is not possible, implement measures to prevent employee exposure.

Secondary Prevention

- Treat atopic eczema topically, and possibly with systemic pharmacotherapy to prevent respiratory allergy (D).
- Treat upper airways disease (rhinoconjunctivitis, sinusitis) to reduce risk of development of asthma (D). In young children already sensitized to house dust mites, pets or cockroaches, exposure should be reduced to prevent onset of allergic disease (B).
- Remove employees from occupational exposure if they have developed symptoms caused by occupational allergic sensitization (C).

Tertiary Prevention

- Infants with cow's milk allergy should avoid cow's milk proteins; if a supplement is needed, use hypoallergenic formula, if available/affordable, to improve symptom control (B).
- Patients with asthma, rhinoconjunctivitis or eczema, who are allergic to indoor allergens such as dust mites, cockroaches and animal danders, should eliminate or reduce the exposure to improve symptom control and prevent exacerbations (A–B).
- Aim pharmacotherapy primarily towards the underlying inflammatory process (A).
- Avoid strictly acetyl salicylic acid or other non-steroidal anti-inflammatory drugs (NSAIDs) in patients who have been appropriately diagnosed as being sensitive to them (C).

Education

- Patient education regarding precipitants of allergic symptoms, asthma, and especially anaphylaxis is essential. Guided self-management to prevent, assess and treat symptoms is the key to optimizing disease control (A).
- School policies on asthma and anaphylaxis management are essential (D).

² Based on allergy prevention studies exclusively breast-feeding and avoidance of solid foods at least 4 months seems to be effective. WHO dietary guidelines recommend exclusively breast-feeding for 6 months in general. Infants who are not breast-fed because their mothers are HIV positive, and who have consequently developed allergy to cow's milk, should receive hypoallergenic formula, if available, to improve symptom control (B).

Appendix 1: Patient Information Sheets: Pull-Out Sheets of Practical Allergen Avoidance Advice

House Dust Mite Allergen Reduction

Aims to reduce the amount of mite allergens in the home

Major Strategies (WHO Strength of Recommendation A)

- Wash bedding regularly (every 1–2 weeks) at 55–60°C, if possible, to kill mites (washing with cold water removes 90% of mite allergens; washing at 55–60°C kills mites but does not denature mite allergens).
- Wash pillows and duvets in hot water 55–60°C and encase pillows and encase mattresses with documented protective coverings.
- Sufficient ventilation of dwellings to decrease humidity; aim to reduce indoor relative humidity to below 50% and avoid damp housing conditions.

Additional Strategies

- Use a good quality vacuum cleaner (if possible one fitted with HEPA filter).
- Use a damp duster when dusting and cleaning surfaces.
- Replace wall-to-wall carpets with linoleum or wooden floors which can be wiped clean.
- Remove/reduce curtains and soft furnishings in the bedroom.
- Replace fabric-covered seating with leather or vinyl.
- Remove soft toys from the bedroom; wash them at 55–60°C or freeze them (in a kitchen deep-freezer) to kill house dust mites.
- Do not allow pets in the bedroom.
- House dust mites are transparent and have no natural protection against sunlight. Exposure of mattresses, rugs and carpets to direct strong sunlight (for more than 3 h) kills mites and can be used in appropriate regions.
- A hammock, easily washable and susceptible to air and sun drying, is used in many areas of the world.

Pollen Avoidance

Provides mechanical barriers to pollen contact

- Keep windows closed at peak pollen times, e.g., in the evening when airborne pollens descend to lower altitudes.
- Wear glasses or sunglasses to prevent pollens entering the eyes.
- Consider wearing a mask over nose and mouth to prevent inhalation of pollens at peak time.
- Do not cut grass yourself.
- Keep windows closed when the grass has been mown.
- Use air-conditioning if possible.
- Install car pollen filters if possible.

Pet Allergen Avoidance

Reduces the amount of pet allergen indoors

- If possible, find another home for the pet, and do not bring new animals into the home.
- Exclude pets from bedrooms and if possible keep pets outdoors.

- Vacuum carpets, mattresses and upholstery regularly, if a power source and equipment are available.
- Change clothes before going to school/work if you have attended your horse/cat/dog.

Cockroach Allergen Avoidance

Removes the cockroaches, eliminates the places and conditions in which they can live, and removes allergens

- Eradicate cockroaches with appropriate insecticides.
- Seal cracks in floors and ceilings.
- Remove sources of food.
- Control dampness.
- Scrub floors with water and detergent to remove allergens.
- Bedding, curtains and clothing can be contaminated and must be washed.

Mould Allergen Avoidance

Prevents mould from growing, and mould spores from becoming airborne during mould removal

Indoors

- Use dehumidifiers in the home if relative humidity is constantly high (above 50%).
- Ensure heating, ventilation or air-conditions systems are properly maintained.
- Use 5% ammonia solution to remove mould from bathrooms and other contaminated surfaces.
- Replace carpets with hard flooring; replace wallpaper with paint.
- Repair indoor water damage immediately

Outdoors

- Avoid cutting grass in late summer when mould spores are present in decaying vegetation.

Severe Reactions, Allergic Anaphylaxis

Aims to prevent contact with the allergens that induce anaphylaxis in susceptible individuals, and to provide strategies for dealing with episodes of allergic anaphylaxis

- Carry an epinephrine auto-injector and know how and when to use it; always have a spare auto-injector available.
- Carry an emergency pager or mobile telephone to call assistance.
- Carry/wear Medic-Alert information.
- When travelling abroad, carry an anaphylaxis-alert card in the language of the country being visited, detailing food, drug, and insect allergies.
- Avoid stinging insects, and learn how not to attract them:
 - do not wear perfumes or bright colours.
 - do not pick ripe fruit, avoid refuse bins and compost heaps which attract insects.
 - keep car windows closed when driving.
- Avoid allergenic ingredients in ready-made food by learning how to interpret ingredient lists.
- If eating out check with the chef that allergenic foods/oils are not used in dishes; explain the significance of avoiding allergenic ingredients.

In the school environment

Ensure that parents, teachers, fellow students, and school administrators are aware of the necessity to provide a safe environment for children at risk for anaphylaxis to foods or insect stings.

- Create a no-food area of the school playground.
- Identify a supervisor to carry a telephone for emergencies.

In the occupational environment

- Avoid contact with airborne or contact allergens; for example, airborne latex can be avoided by co-workers using powder-free latex gloves.

Appendix 2: Content of Educational Programs in Allergy and Allergic Asthma

Allergic Asthma and Allergic Rhinitis

Appropriate actions for guided self-management include

- 1 Developing good communication between patient and physician to improve patient compliance.
- 2 Promoting understanding about the basic facts, causes and triggers of allergic asthma/allergic rhinitis.
- 3 Identifying and controlling factors that aggravate asthma/rhinitis symptoms and provoke exacerbations.
- 4 Following a written action plan to avoid or handle exacerbations.
- 5 Emphasizing the importance of proper drug use and correct use of spacers and inhalers, for long-term control.
- 6 Monitoring symptoms and peak flow values in persistent asthma and adjusting medication accordingly.
- 7 Educating to decrease reliance on unproven treatments.

Eczema

Educational programs in eczema should include

- 1 Informing about nature, heredity, causes and triggers of eczema.
- 2 Identification and avoidance of individual provocation factors, skin care and treatment options, including complementary therapies.
- 3 Discussion of diagnosis and treatment of food allergies and adequate nutrition in childhood.
- 4 Behaviour-oriented psychological intervention to interrupt the itching-scratching cycle.
- 5 Training to improve stress-management and reduce the negative social effects of illness-specific problems.

Severe Reactions, Allergic Anaphylaxis

Each patient should have an individual management protocol to include

- 1 Carrying an epinephrine auto-injector and knowing how and when to use it; always have a spare auto-injector available.
- 2 Carrying an emergency pager.
- 3 Carrying/wearing Medic-Alert information.
- 4 Avoiding stinging insects, learning how not to attract them.
- 5 Avoiding allergenic ingredients in ready-made food

In the school environment

Education of parents, teachers, fellow students, and school administrators is necessary to provide a safe environment for children at risk for anaphylaxis to foods or insect stings.

- 6 Creating a no-food area of the school playground.
- 7 Identifying a supervisor to carry a telephone for emergencies.

In the occupational environment

Health and Safety measures should be introduced to prevent exposure of affected workers to airborne or contact allergens.

These appendices are also available as PDF downloads from the journal's home page at www.karger.com/iaa

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