

# Airborne contact dermatitis: changing etiological paradigm

Farhana Muzaffar\*, Tahir Saeed Haroon\*\*

\* Department of Pediatric Dermatology, ICH/The Children's Hospital, Lahore

\*\* Department of Dermatology, King Edward Medical College, Mayo Hospital, Lahore

Airborne-contact dermatitis (ABCD) represents a morphological pattern of contact dermatitis arising from pollens, dust, sprays, or volatile chemicals by airborne fumes or particles without directly handling this allergen.<sup>1</sup> Both, exposed, as well as, nonexposed skin can be affected. It usually involves face, neck, V-area of chest and eyelids. Axillae and waist line can also be affected. The disease can sometimes progress to erythroderma generalized.<sup>1,2</sup> Allergic, irritant, Photoallergic or phototoxic mechanisms, all can contribute to the causation of ABCD.

Human environment is estimated to contain more than 85,000 chemicals which may cause allergic or irritant contact dermatitis. More than 3,700 compounds have been identified so far as contact allergens.<sup>3</sup> Hence, the list of causes of ABCD continues to expand.<sup>4</sup>

ABCD can occur both in occupational and nonoccupational settings. The etiological spectrum of disease is very broad including plants, cement, wood dust, various acids and alkalis, metals and powders of metallic salts, industrial solvents, glass fibers, sewage sludge, ammonia, vegetable and wood allergens, plastics, rubbers and glues, insecticides,

pesticides, animal feed additives, drugs and many others.<sup>1</sup>

Plants of *Compositae* family e.g. *Parthenium hysterophorus*, *Xanthium strumarium*, *Chrysanthemum coronarium*, *Helianthus annuus* (sunflower) and *Dahlia pinnata* are considered to be the major cause of ABCD in United States<sup>5</sup> and India.<sup>2</sup> Scanty local data also suggest parthenium allergy to be common in Pakistani context.<sup>6,7</sup> The most important allergens in *P. hysterophorus* responsible for ABCD are sesquiterpene lactones (SLs), consisting of a lactone ring attached to a sesquiterpene. SLs are lipophilic and are chiefly found in the oleoresin fraction of the plant. Parthenin, a member of the pseudoguinolide class of SLs, is the major allergen. An alpha methylene group exocyclic to gamma lactone is considered to be essential for the induction of allergy. The other allergens that have similar group are coronopilin and tetraeneurin A. SLs are also found in other genera, namely, liverwort (*Frullania*), tulip tree (*Liriodendron*, Magnoliaceae) and sweetbay (Lauraceae, *Laurus nobilis*). Cross reactions are possible among these genera.<sup>1</sup>

Other principal sensitizers of plant origin include phenols (*Anacardiaceae*), quinones (Tectona, rosewood), and terpenes (*Frullania*, Pinus).<sup>4</sup> ABCD results from exposure to airborne pollens of plants, but allergens can also be found in non-pollen-bearing fractions of ambient air.

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## Address for correspondence

Dr. Farhana Muzaffar, Associate Professor  
Department of Pediatric Dermatology,  
Institute of Child Health/The Children's  
Hospital, Lahore  
Email: dr\_farhana62@hotmail.com

This may explain the poor correlation between clinical severity and pollen concentration in the surrounding air.

In the recent past this etiological paradigm has been changing rapidly in urban and semiurban areas throughout the world. This can be attributed to factors like development of newer compounds, globalization, use of banned chemicals and changing environment and culture etc.

Due to rapid industrialization and urbanization, huge quantities of organic compounds are produced and used, thus exposing urban population to potential contactants of ABCD.<sup>8</sup> Fragrance allergy due to increased use of cosmetics, perfumes, deodorants, toiletries etc. is on rise in Western hemisphere, as well. Recently, a report of the daily Telegraph warned about epidemic of cutaneous allergies due to toiletries containing isothiazolinone preservatives methylisothiazolinone (MI), methylchloroisothiazolinone (MCI), and benzisothiazolinone (BIT).<sup>9</sup> These chemicals are used in a wide variety of products including cosmetics and paints. The rate of contact allergy and allergic contact dermatitis caused by MI is dramatically increasing throughout Europe. In 2012, the sensitization rate for MCI/MI had increased to 4.5% and that for MI to 6.0%; the latter showed a further increase to 7.2% in 2013.<sup>10</sup> The people mainly affected are women with hand and/or facial dermatitis, most often resulting from the use of cosmetics. Simultaneous reactions to octylisothiazolinone were observed. Now, these preservatives-free toilet products and cosmetics are recommended. Among painters they are one of the most common causes of contact dermatitis. Due to volatile nature and prolonged emission and evaporation, they are common cause of ABCD in painters and consumers.

Man-made vitreous fibres (MMVFs) are used in building industry for insulation and as reinforcement in materials. Skin gets contaminated through direct or indirect exposure and deposition of airborne fibres. Workers handling MMVF products develop ABCD. Complaints caused by traditional (yellow) glass fibre products were more severe than those caused by products of rock or slag wool fibres.<sup>11</sup>

Globalisation has increased patients' exposure to products or foods from other cultures or countries. Consumers of such products may come in contact with irritants or allergens not yet known in their indigenous environment e.g. rising dimethylfumarate contact allergy in Europe. Moreover, the so called 'low-cost' goods manufactured in the third world countries may contain many banned or strongly regulated allergens e.g. nickel in jewelry or telephones, some dyes in clothes or preservatives in cosmetics. Similarly, disinfection measures practiced for freight containers in ports may lead to fumigants and other toxic products contaminating the air and the transported products, thus worsening the cutaneous allergic problems.<sup>12</sup>

Previously, horse and cow dander was considered common aeroallergen in occupational setting. However, indoor pets, dogs, cats, birds, house dust mite, cockroaches, moulds etc. are new proposed sources of house dust allergy. Indoor exposure to airborne allergens at home, work or school may be a potential source of ABCD.<sup>3,13</sup> The mammalian allergens belong to two complex protein classes, lipocalins and secretoglobins with a relatively minor contribution of serum albumins, cystatins and latherins. Both the lipocalin and the secretoglobin family are very complex.<sup>14</sup>

Allergic disease may also be increased by climate change in a geographical region. Climate has great impact on human population and plant distribution, pollen levels, air pollutants, automobile-related particulate emission etc.<sup>15</sup> A study from Korea<sup>16</sup> showed increased incidence of allergic disease barring asthma following typhoon and heavy rain consequent to concentration of airborne allergens of pollens, ozone, and fungus.

A similar change in the etiological paradigm is expected to occur in the developing countries and local perspective, too. The changing urban and rural distribution of population, improving living standards, the rising use of cosmetics of questionable quality, frequent international travelling, climatic changes etc. are likely to contribute to this change. Establishing an accurate diagnosis is critical for preventing exposure and improving symptoms in patients. While searching for the cause, relevant newer potential sources should be kept in mind. The responsible agents can be isolated by microscopic study and chemical analysis of the air or materials in the air.

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