Not as Easy as ABCD: Airborne Contact Dermatitis

What do those words, airborne contact dermatitis (ABCD), make you think of? This time of year, plant allergies may spring to mind because most of the cases seen in clinical practice tend to be related to plants. The dermatitic reactions caused by pollen from members of the Compositae family such as ragweed, feverfew, and tansy or by members of the genus Toxicodendron such as poison ivy, poison oak, and poison sumac are probably the most well-known plants associated with allergic contact dermatitis. Plants, however, are not the only culprits underlying ABCD. Indeed, many nonplant allergens, including pharmaceutical agents, cosmetics, organic compounds, pesticides, dust particles from metals, and occupational allergens, have also been reported to cause the condition.

Because ABCD is challenging to diagnose, its prevalence is unknown and often considered to be underestimated. Based on a report from Belgium, the prevalence of ABCD between 2007 and 2011 was almost 3.2%. In a recent retrospective evaluation of more than 200,000 consecutively patch tested patients in Germany from 1994 to 2013; however, only 0.6% of the patients (1,203) were diagnosed with ABCD. Of those, 35% of the cases were associated with an occupational background. This finding provides an underpinning for the fact that most of the published cases of ABCD have thus far been related to occupational exposures.

ABCD must be differentiated from four other main types of airborne dermatitic reactions: airborne irritant contact dermatitis, airborne phototoxic reactions, airborne photallergic reactions, and airborne contact urticaria. And, of course, some agents can cause more than one type of reaction or even mask another type. Like most subjects related to all things contact dermatitis, the topic is complicated! The primary distribution of ABCD, typically defined as an inflammatory reaction caused by exposure to particles suspended in air that then settle on exposed skin, includes sites most likely to be uncovered—the face, neck, V region of the chest, and forearms. The palms of the hands may be involved from contact with items contaminated by deposition of the responsible allergen. Involvement of the susceptible thin skin of the upper eyelids and the retroauricular and submandibular regions can be used to differentiate ABCD from photodermatitis, which spares the parts of the body situated in anatomical shadows.

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There are multiple risk factors for ABCD. Primary among them is living in an arid environment where the dryness can disrupt the skin’s protective barrier and the heat can increase perspiration and hence adhesion of allergens to the skin. In such places airborne pollen or fine dust from desiccated plants disseminated by the wind may be the source. Smoke from burning brush can also carry allergens. In the southwestern desert of the United States ABCD has been associated with the plant, Parthenium hysterophorus, a weed accidentally introduced to India in a shipment of wheat from America. Subsequently, this imported sensitizer caused a devastating epidemic of allergic contact dermatitis in that country perpetuated by both direct contact and airborne distribution. Parthenium has even been associated with fatalities by causing universal erythroderma nonresponsive to systemic corticosteroids. The principal sensitizing agent in the plant is the sesquiterpene lactone, parthenolide. This allergen, which is on the third panel of T.R.U.E. TEST, can be used to detect allergic contact dermatitis caused by plants. Besides plant pollen, airborne proteins from house dust mites, cockroaches, and pet dander may be implicated in patients with atopic dermatitis resistant to treatment.

Individuals who work in certain occupations are also at risk for developing ABCD from a variety of agents. The list is long and precludes mentioning all of the possibilities here, but a sampling follows. For example, farmers and those who use cleaning products regularly may develop reactions to ammonia from disinfectants and fertilizers. Workers in construction-related occupations may be exposed to airborne chrome from cement, paints, and metal alloys. Construction workers and those who work with paint in other contexts may react to epoxy resin found in glues and other adhesives, paint products, and plastics. Fiberglass, which is found in boats, cars, aircrafts, helmets, insulation and even clothing, can be a source of exposure for those working in related industries. ABCD from formaldehyde is a risk in the textile and building and construction industries. Those who work with jewelry, photography, electronics, and dentistry may be exposed to products incorporating gold. Medications such as azathioprine, budesonide, famotidine, lansoprazole, and methotrexate place workers in the health care and pharmaceutical industries at risk. Other widespread causative agents of ABCD include methylchloro- and isothiazolinone, which are preservatives used in products such as cleaning agents, cosmetics, and paint; the almost ubiquitous allergens natural rubber latex and nickel; and wood dust from both tropical and domestic woods.

Once an airborne allergen is identified, an avoidance strategy must be implemented. If plants underlie ABCD, outdoor activities may need to be curtailed on a seasonal basis although doing so may not eliminate the problem. Frequent laundering of clothes and bedding, combined with frequent bathing, can help reduce exposure to protein, plant, or other allergens. Emollients and barrier creams should be used to maintain the integrity of the skin, especially in atopic patients. Immunosuppressive therapy may be needed to treat severe cases of ABCD.

Because the efficacy of these strategies can be limited, moving to a different area or changing jobs entirely may be the only recourse for improvement in worse-case scenarios. Helping patients with this challenging disorder to avoid making such disruptive life-changings decisions, if possible, is a priority. Still, treatment outcomes have often been disappointing due to the difficulty in achieving complete allergen avoidance. Nonetheless, the process must begin with obtaining a diagnosis, and a patient’s history (especially of atopy), physical examination, and timeline of the disease are important factors. As always, however, patch testing can help rule out other types of reactions and can confirm the presence of allergic contact dermatitis to specific allergens.

References
Breuer K, Uter W, Geier J. Epidemiological data on airborne contact dermatitis—results of the NVDK. Contact Dermatitis 2015;73:239-247
Huuggens S, Goossens A. An update on airborne contact dermatitis. Contact Dermatitis 2001;44:1-6
Schubert H. Airborne contact dermatitis due to methylchloro- and methylisothiazolinone (MCI/MI). Contact Dermatitis 1997;36:274

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Spot On: A Screening Tool for Chromium?

One of the most challenging aspects of disease is translating findings from related research into useful and meaningful clinical practices. In terms of a condition such as allergic contact dermatitis, one practical approach to helping affected patients involves finding ways to help them identify objects that may contain their particular allergen to improve their ability to avoid exposure to it. Our colorimetric spot tests, Reveal and Conceal™ nickel and cobalt, were developed for this purpose. Both products are applied with a swab applicator to a metal surface suspected of containing nickel or cobalt as appropriate. If the test is positive, the moist swab changes color within seconds. As of yet, nickel and cobalt are the only two allergens for which such a test is available, but recent research raises the hope that a third such test might become available in the future.

Recently, a group of Danish researchers used diphenylcarbazide (DPC) as a spot test for hexavalent chromium (chromium(VI)) (Bregnbak D, Johansen JD, Jellesen MS, Zachariae C, Thyssen JP. Chromium (VI) release from leather and metals can be detected with a diphenylcarbazide spot test. Contact Dermatitis 2015;73:281-288). This metal, which is used in the process of tanning leather, was discussed in the previous issue of this newsletter in the context of shoe dermatitis (see Issue 14, December 2015). Although historically the primary source of exposure to chromate was from cement, leather has now gained the dubious distinction of being the leading cause of chromium allergies. A practical spot test that would reliably screen for chromium, the third most important metal allergen, has the potential to improve the lives of many patients.

Apparently, a spot test for chromium was suggested as early as 1958, and DPC is used in other applications as an indicator of chromium(VI) release. However, the Danish article is the first systematic evaluation of the viability of DPC as a spot test reagent. The authors tested the efficacy of DPC in identifying chromium(VI) from a variety of common products such as work tools, jewelry, and leather shoes and gloves. In the same way that nickel and cobalt spot tests are performed, a swab soaked in the DPC solution was rubbed against the tested objects. When chromium ions were released from a tested item, the swab turned reddish-purple. The color change was weak at 0.25 ppm and clearly visible at 0.5 ppm.

As expected, the test worked well with metal items. Unexpectedly, however, it also produced a high rate of positive findings when leather items were tested. X-ray fluorescence (XRF) was used to confirm the presence of chromium in all items that tested positive with the DPC. XRF, which is ideal for characterizing metal objects, detected chromium in all of the metal items that were DPC-positive. Even though XRF can only be considered semi-quantitative for leather, it still confirmed the presence of chromium in 9 of the 10 DPC-positive footwear and gloves. Furthermore, the item (a shoe) that was negative for chromium release on XRF also had the lowest release of all samples on the DPC screening test.

Although the study had limitations and further investigation of the sensitivity and specificity of the DPC spot test is needed, the initial results are promising. As the authors note, the limit of detection was below the current limits of chromium imposed by the European Union (EU) on both cement and leather products. Eventually, the EU regulation, if well enforced, can be expected to decrease the rate of chromium allergy in the member countries. In North America and other countries that lack such regulations, a screening test for chromium would indeed be a welcome development.
Allergic Contact Dermatitis and Education

Literature on the effect of training on patch test readings is sparse to say the least. And what we know tells us there is room for improvement. Based on a survey of the 112 dermatology programs in the United States conducted in 2010, only 4 to 5 didactic hours, on average, were devoted to allergic contact dermatitis during the course of a residency—a number that was virtually unchanged from that reported in a similar survey conducted in 2002. Based on the responses from program chairs who returned their surveys, no patch testing at all is done by residents in about 15% of the programs. Yet the combination of thousands of potential allergens, many challenging differential diagnoses, and the high economic and emotional costs associated with undiagnosed and untreated contact dermatitis suggest that the burden of this disease requires more instruction than clinicians may receive.

Expertise in patch testing gets no easier to acquire when the many variables involved and overall lack of standardization in the process are considered. Which allergens should be used? And how many? How much allergen at what concentration is needed? Does choice of chamber make a difference in outcomes? Most clinicians would probably agree that the length of occlusion should be 48 hours, but when should the results be read? What allergens will be missed if readings are restricted to 72 hours? What allergens will be missed if results are first read at 96 hours instead of 72 hours?

Then comes the step perhaps most crucial to the patient: interpretation of the readings. When training cannot include hands-on experience, viewing patch test reactions projected on a screen or viewed digitally has been used as an alternative learning technique. Subtleties may be lost in grading the severity of reactions, but the distinction between allergic and nonallergic ultimately is what will guide assessment of relevance and treatment recommendations. As part of our mission to ensure that patients with contact dermatitis receive the diagnosis that they deserve, the Contact Dermatitis Institute offers a variety of educational opportunities related to patch testing. Practitioners who prefer to learn at their own pace can explore our online patch test learning modules. Those who prefer intensive, hands-on immersive training might want to mark their calendars to save the date for our upcoming Patch Test Workshop in January 2017.

High WA, Cruz PD Jr. Contact dermatitis education in dermatology residency programs: can (will) the American Contact Dermatitis Society be a force for improvement? Am J Contact Dermat 2003;14(4):195-199


Silverberg JI. Health care utilization, patient costs, and access to care in US adults with eczema: a population-based study. JAMA Dermatol 2015;151(7):743-752

Uter W, Gefeller O, Mahler V. Does a short patch test training course have an impact? Contact Dermatitis 2016;74:295-319

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