Allergic Contact Dermatitis

Lisa Kostner, MD[a], Florian Anzengruber, MD[a], Caroline Guillod, MD[a], Mike Recher, MD[b], Peter Schmid-Grendelmeier, MD[a], Alexander A. Navarini, MD, PhD[a,*]

KEYWORDS

• Contact • Dermatitis • Allergen • T cell • Patch • Work related

KEY POINTS

- Allergic contact dermatitis (ACD) is one of the most common work-related conditions.
- Clinical features of chronic ACD and irritant contact dermatitis may overlap.
- Identification of the offending allergen in ACD is often circumstantial.
- New techniques are required to overcome these challenges.

INTRODUCTION

Allergic contact dermatitis (ACD) seems a straightforward and simple disease. The problem is easily defined: it is a cutaneous immune reaction against 1 or more nontoxic allergens that come in contact with the skin. All the patient should need to do is to get rid of the allergen. However, detection, allergen avoidance, and therapy are often very difficult. Therefore, ACD can affect patients for years and is a grave socioeconomic problem.

ACD and irritant contact dermatitis (ICD) can lead to mostly similar clinical phenotypes, even though the latter is much more common and not caused by an immune reaction to well-defined allergens. Together they make up more than 90% of occupational skin disorders. Affected patients have great impairment in their quality of life and experience long periods of sick leave, which has an important socioeconomic impact.

The 1-year prevalence for allergic contact eczema is about 15%.[1,2] Therefore, it concerns groups of all ages with high prevalence and incidence, even though elderly people are often affected because of impaired epidermal barriers or alterations of immune reactivity.[3] The 2 main groups of contact eczema coexist in many cases and differentiating between them often proves to be difficult. Both diseases can have similar clinical and histologic aspects.

[a] Department of Dermatology, University Hospital Zurich, Gloriastrasse 31, 8091, Zurich, Switzerland; [b] Immunodeficiency Clinic, Medical Outpatient Unit and Immunodeficiency Lab, Department Biomedicine, University Hospital, Petersgraben 4, 4031, Basel, Switzerland
* Corresponding author.
E-mail address: alexander.navarini@usz.ch

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EPIDEMIOLOGY

Between 4% and 7% of all dermatology consultations are for contact dermatitis. In Sweden, about 10% to 12% of adults had hand eczema during a period of 1 year. However, the tendency for ACD is decreasing slightly, and is inversely mirrored by the increase of atopic dermatitis. The point prevalence of contact sensitivity is 15.2% in teenagers. In adults, this is much higher and can reach 18.6%. This higher rate may be mostly caused by the cumulative opportunities of sensitization rather than an effect of age, because the latter does not have a direct influence on capability for sensitization. The prevalence of pure ACD is difficult to measure because ACD and ICD usually coexist. The incidence of occupational dermatitis per 1000 workers per year is about 0.5 to 1.9 in most European countries.

PATHOMECHANISM

ACD develops only after an initial sensitization[4] phase with usually innocuous substances; usually small molecules that cannot be recognized on their own by the adaptive immune system. However, when they are bound to cutaneous proteins they can associate with major histocompatibility complex (MHC) class II antigens (MHC II). Some chemicals can also directly bind to MHC II that are present on Langerhans cells and other epidermal antigen-presenting cells, mostly of dendritic origin. After application, it takes about 6 hours until the allergen is presented on these cells. Additional signals such as inflammatory cytokines (eg, tumor necrosis factor alpha, interleukin [IL] 1-β) can support sensitization and could arise from irritation of the skin, perhaps explaining the close connection of allergy and irritation in this disease. Also, MHC molecules are upregulated. The activation (priming) of specific T cells takes place in the lymph nodes. The antigen-presenting cells migrate there and depending on the nature of the antigen present it on MHC II (ie, a polar hapten) or MHC I (ie, the small lipid soluble molecule urushiol). T cells then proliferate in the lymph nodes, primed T-cell clones start to disseminate throughout the skin, and cutaneous lymphocyte antigen–positive T cells thereafter stay in the skin for long periods of time.[5] Activated T cells produce cytokines such as interferon gamma, IL-2, and IL-17. They are attracted to the locus of inflammation by keratinocyte-derived CCL27, which binds to their CCR10. T cells have an apoptotic effect on keratinocytes because of their FasL and perforin expression. These combined effects ultimately lead to the clinical phenotype of ACD. Taken together, the delayed hypersensitivity reaction is caused by the previously activated T cells, which only at second contact cause rapid inflammation.[6,7] As an exception, a single, prolonged contact with an allergen may lead to ACD, but this should require several days to develop. The sensitization phase is specific for ACD and is not a feature of ICD, even though similar clinical features develop in both conditions. In ICD, the inflammation is caused by the irritant, which (somewhat in contrast with ACD) is dose dependent.

CLINICAL FEATURES

ACD presents with erythema, edema, vesicles, oozing, and notably intense pruritus. In the mildest form, only erythema is visible at the site of contact; sometimes, the type of substance can be already suspected (ie, when liquid tracks are visible). Stronger reactions include spongiotic vesicles that itch and burst quickly, weeping intensively and crusting thereafter (**Fig. 1**A, B). In ACD caused by a single exposure, all lesions are at the same stage in this process.[8] When it becomes chronic, the term eczema is used and features such as hyperkeratosis, desquamation, lichenification, and