Chapter 5

Contact Urticaria

Isil Bulur and Hilal Gokalp

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/67994

Abstract

The term "contact urticaria" was first used by Fisher in 1973 as a pruritic wheal and flare reaction appearing within minutes after the contact of the skin with the substance causing the reaction. The incidence is not clearly known due to misdiagnosis. The causative agents can be plants, food substances, drugs, cosmetic products, chemicals and animal products. Contact urticaria is classified according to the underlying mechanism as non-immunologic (irritant), immunologic (allergic) and mixed (undetermined). It is usually local but can rarely cause systemic symptoms and sometimes result in anaphylaxis. Diagnostic tests include the prick test, open test and RAST test. The main treatment step is avoiding the causative agent.

Keywords: urticaria, contact, sensitization, immunologic, irritant, occupational

1. Introduction

The term "contact urticaria" was first described by Fisher in 1973 as a pruritic wheal and flare reaction occurring within minutes after contact with the suspected contact substance [1]. Contact urticaria is accepted as one of the chronic inducible urticaria disorders and is seen in 1–2% of chronic urticaria patients [2, 3]. Although the disorder is thought to be common, its clear incidence is not known due to underreporting and underdiagnosis [4–6]. It is often seen on the face, hands and arms and is characterized by itching, redness and swelling [7]. A wide variety of allergens including animal products, plants, food, chemicals, cosmetics, flavoring, medications, enzymes and metals are responsible for contact urticaria development (**Table 1**).

Contact urticaria is classified according to the underlying mechanism as non-immunologic/irritant, immunologic/allergic urticaria and those with mixed/undetermined pathomechanism [4]. Non-immunologic contact urticaria (NICU) is often characterized by localized reactions regressing within a short time. Immunologic contact urticaria (ICU) occurs as a type 1

• Animal-animal derivated products (blood, urine, saliva, seminal fluid, hair), meat, milk, cheese, eggs, honey silk, wool
• Cosmetic components: hair care products (ammonium persulphate, henna, parafenilendiamin), emulsifiers, fragnances, allantoin, aloe gel
• Dyes: an azo, anthraquinone or phthalocyanine derivative
• Enzymes
• Foods: furits, vegetables, meat, fish, spice, plants, grains
• Food additives:flavoring, fragnansec, taste enhancer
• Metals: aluminum, chromium cobalt, copper, gold, nickel, zinc
• Natural rubber latex
• Plants: weed, wood, ornamental
• Preservatives and disenfectants: sodium benzoate, benzoic acid, benzyl alcohol, sorbic acid, formaldehyde, parabens, povidone-iodine, chloramine, chlorhexidine

Table 1. Contact allergens causing contact urticaria [5, 6].

hypersensitivity reaction in previously sensitized individuals and there may be involvement in the respiratory and gastrointestinal system in addition to the skin, resulting in anaphylactic reaction [7]. Contact urticarial syndrome (CUS) is characterized by systemic findings occurring within minutes after contact with the contact allergen, and it was first identified in 1975 by Maibach and Johnson [8, 9].

Contact urticaria usually causes a localized and transient reaction and the diagnosis is therefore often missed. However one must consider that it leads to a marked decrease in the patient's quality of life. It is therefore essential to diagnose the condition and determine the suspect agent.

This chapter reviews the definition of contact urticaria together with the causative agents, diagnostic tests and ways to avoid the disorder together with a survey of the literature.

2. Classification of contact urticaria

2.1. Non-immunologic contact urticaria

Non-immunologic contact urticaria occurs with the first contact of the person to the substance causing reaction. It is the most common type of contact urticaria. NICU is thought to occur with the stimulation of vasogenic mediators without involvement of immunological processes [4]. In addition to nonspecific histamine secretion, leukotriene, prostaglandin, substance A and eicosanoids are also responsible for this reaction [4, 10].

"Stinging nettle (Urtica dioica)" is best known among the agents that lead to NICU. Preservatives, fragrances, foodstuffs, cosmetics, toiletries, topical medications, chemicals and insecticides can

also cause NICU (**Table 2**). The severity and duration of the reaction in NICU vary according to the size of the contact area and the substance. It is characterized by localized redness, swelling, itching and burning. The lesion tends to regress within hours [4]. NICU is mostly seen on the face, antecubital fossa, upper back, upper arm, volar forearm and lower back.

2.2. Immunologic contact urticaria

Immunologic contact urticaria is a type 1 hypersensitivity reaction after contact of the allergen to the skin and mucosa. It often occurs with IgE sensitization but IgG and IgM can also be responsible for complement activation [10]. The penetration of the allergen to the epidermis results in IgE binding to the mast cells and the secretion of vasoactive substances such as histamine, prostaglandin, leukotriene and quinine [6]. While proteins with a molecular weight over 10,000 lead to sensitization directly, chemicals with a low molecular weight (below 1000) act like a hapten and bind to carrier proteins such as albumin to cause ICU [6, 10].

Atopic individuals are more prone to ICU development [10–12]. The identification and diagnosis of the disorder therefore become difficult especially in individuals with eczema. One of the significant characteristics of the disease is that it is not only related to the skin but can be generalized with respiratory and gastrointestinal system involvement and anaphylactic shock, leading to systemic findings [4]. Protein (animal proteins, plants) and non-protein (chemicals, drugs and metals) materials can cause ICU (**Table 3**).

Natural rubber latex is the most common allergen held responsible for ICU [4]. Latex is a fluid obtained from the body of the tropical rubber tree (*Hevea brasiliensis*) and is a natural rubber resource. Latex proteins are allergenic and preserve their antigenic characteristics in the final product. Gloves, catheters, tourniquets, stethoscopes, masks, electrode tips, balloons, condoms, pacifiers, stretch clothes, shoe soles and underwater goggles contain latex [13]. Health workers, cleaning workers and hairdressers are often at risk. However, natural latex rubber is common in daily life and the general population is also at risk in terms of ICU development [13–15]. Cross-reaction with latex has been identified with fruits (avocado, banana, apple and kiwi), vegetables (paprika, carrot, celery, potato and tomato), plants and pollens [4, 16–21]. It must also remember that the raw food protein can show allergenic reaction, but the reaction disappears when these cooked. This applies to raw fish, garlic and herbs in particular [22].

2.2.1. Contact urticaria syndrome

The term "contact urticaria syndrome" was first used in 1975 by Maibach and Johnson to identify the systemic reaction developing after contact with a substance [8]. CUS is more common in ICU, but can also develop in NICU [23]. It is characterized by a heterogeneous clinical picture including systemic findings occurring immediately following a contact urticaria reaction. The systemic involvement consists of four stages identified by von Krogh and Maibach [9] (**Table 4**). Localized urticaria is seen at stage 1 and generalized urticaria at stage 2. Stage 3 is characterized by bronchial asthma, rhinoconjunctivitis, orolaryngeal syndrome and gastrointestinal dysfunction and

Immunological contact urticaria

- Acetylsalicylic acid
- Aminophenazone
- Bacitracin
- Benzophenone
- Benzoyl peroxide
- Benzylic alcohol
- Butylhydroxytoluene
- Cephalosporins
- Chloramine T
- Chlorhexidine
- Chlorpromazine
- Colophony
- Copper
- Di(2-ethylhexyl) phthalate (DOP)
- Diethyltoluamide I
- Diglycidyl ether of bisphenol A (DGEBA) epoxy resin
- Etofenamate
- Gentamycin
- Levomepromazine
- Lindane
- Methylhexahydrophthalic anhydride
- Methylmetacrylate
- Naphthylacetic acid
- Nickel
- Neomycin
- Nylon
- Oleic acid
- *O*-phenylphenate
- Penicillins
- Phenoxyethanol
- Phenylmercuric acetate
- Platinum salts
- Polyethylene
- Polyfunctional aziridine hardener

- Promethazine
- Propylene glycol
- Pyrazolone
- Rifamycin
- Wool alcohol
- Xylene

Non-immunological contact urticaria

- Acetic acid
- Amyl alcohol
- Balsam of Friar
- Benzaldehyde
- Benzoic acid
- Butyl alcohol
- Butyric acid
- Capsaicin
- Chlorocresol
- Chloroform
- Cinnamaldehyde
- Cinnamic acid
- Cobalt chloride
- Diethyl fumarate
- Ethyl alcohol
- Isopropyl alcohol
- Nicotinic acid
- Sodium benzoate
- Sorbic acid
- Tar

Immunological/non-immunological contact urticaria

- Benzocaine
- Balsam of Peru (*Myroxylon pereirae*)
- Formaldehyde
- Fragrances
- Iodine
- Menthol
- Persulfates

Table 2. Non protein molecules responsible for contact urticaria [10].

Animals and their derivates

- Aminiotic fluid
- Blood
- Calf
- Cow
- Caterpillar
- Dogs
- Guinea pig
- Horse
- Hair (human, mice, rat)
- Jellyfish
- Mites
- Pig
- Plasenta
- Rat
- Saliva
- Serum
- Silk
- Urine
- Worm

Plant and derviates

- Algae
- Aloe
- Birch
- Camolile
- Corn powder
- Elm tree
- Larch
- Lime
- Mulbery
- Poppy flowers
- Sunflower seeds
- Tobacco
- Tropical woods
- Tulips

Plant derivates

- Abietic acid
- Colophony
- Cornstrach
- Latex rubber
- Turpedine

Vegetables

- Asparagus
- Beans
- Cabbage
- Celery
- Fungi
- Garlic
- Lettuce
- Mushroom
- Mustard
- Onion
- Rice
- Soybean
- Tomato

Fruit

- Apple
- Apricot
- Banana
- Kiwi
- Lemon
- Lime
- Mango
- Orange
- Peach
- Peanut
- Plum
- Strawbery
- Watermelon

Meat: beef, calf, lamb, chicken, Turkey
Fish: cod, crab, frog, seafood, raw fish
Other animal product: cheese, egg, honey, milk

Table 3. Protein molecules responsible for contact urticaria [6].

stage 4 by anaphylaxis [9]. CUS is characterized by itching, burning and pain associated with an urticarial plaque in the localized form. The disease can result in nasal symptoms, conjunctivitis, bronchospasm, dyspepsia and anaphylactic shock following angioedema. Non-dermatologic symptoms can be seen in 15% of the patients [9].

2.3. Mixed/undetermined pathomechanism

The pathogenesis is not clear for some of the substance, while certain agents result in only immunologic or non-immunologic urticaria. Ammonium persulfate is an example of these substance that can cause contact urticaria with an undetermined pathomechanism [4, 9] (**Table 2**).

• Stage 1: Localized urticaria, dermatitis, nonspecific symptoms (itching, tingling, burning, etc.)
• Stage 2: Generalize urticaria
• Stage 3: Bronchial asthma, rhinoconjunctivitis, orolaryngeal symptom and gastointestinal dysfunction
• Stage 4: Anaphylactic and anaphylactoid reaction

Table 4. Contact urticaria syndrome staging [9].

3. Special types of contact urticaria

3.1. Occupational contact urticaria

Skin diseases are the second most common occupational diseases in Europe and occupational contact urticaria (OCU) makes up 1–8% of occupational skin disorders [12]. The most commonly affected professional groups are healthcare employees, food handlers, farmers and hairdressers [24, 25]. Immunologic and non-immunologic contact urticaria types can be seen in OCU. The risk of sensitization against all proteins is high in presence of atopy in OCU [10]. Besides, atopy is also important in OCU associated with NICU [10].

Natural rubber latex is the most commonly identified allergen and this allergy is seen in 1–3% in general population and 5–10% of healthcare workers in Europe [10]. *H. brasiliensis* proteins are the main responsible agents for natural rubber latex allergy [10]. A reaction against modified proteins (wheat, soy and Croetin Q) that are added to shampoo and especially ammonium persulfate is often observed in hairdressers [26, 27]. Reactions against saliva, amniotic fluid, urine and seminal fluid of animals have been defined in animal handlers, farmers and veterinarians. Dyes cause contact urticaria at significant levels in the cosmetic and industrial sectors [4, 6].

3.2. Oral allergy syndrome (food contact dermatitis)

"Oral allergy syndrome" is used to identify ICU developing in the mucosa [28]. It is characterized by mucosal edema, itching and a burning sensation after contact of the oral mucosa with respiratory allergens [29]. Cross-reactivity between homologous pollen and food allergens is accused in the etiology [29]. The term pollen-food allergy syndrome (PFAS) can therefore also be used [30].

Fruits and vegetables especially apples, carrots, tomatoes, pears, cherries, plums, celery, spices and hazelnuts are the agents that are often blamed for the oral allergy syndrome. The individuals who have oral allergy syndrome frequently suffer from atopy and pollen allergy, therefore a cross allergy against IgE antibodies has been observed [30].

3.3. Physical contact urticaria

Some physical urticaria cases occur following skin contact with hot, cold, light (UV: solar urticaria), water or as dermographism, pressure hives and vibratory angioedema. A physical

agent does not cause a reaction alone but leads to the activation of a chemical product in some cases. It is possible to see this mechanism in induced contact urticaria. Benzophenones, chlorpromazine, methenamine hippurate and formaldehyde are included among the agents that can cause such a reaction [31–33].

3.4. Delayed and prolonged contact urticaria

Contact urticaria, protein contact dermatitis and allergic contact dermatitis can sometime coexist. The patients can primarily present with an urticarial lesion and the contact dermatitis and eczematous lesions can develop later [32, 34]. Elm, vaseline and castor oil are agents that often cause delayed and prolonged contact urticaria [10].

4. Diagnosis

The contact urticaria diagnosis is made with a detailed history and dermatologic examination. The detailed history should include the occupation, hobbies, additional systemic disorders and current medication of the patient, and when the lesion started, how long it lasted and the presence of accompanying symptoms (allergic rhinitis, conjunctivitis, gastrointestinal symptoms and angioedema) [7]. An open test, patch test, prick test, scratch test and intradermal test are the test mainly used for diagnosis.

The allergens are properly prepared and applied to the skin of the inner surface of the forearm or back in the open test. The test is conducted both with cooked and uncooked samples of the foods. The evaluation of the contact urticaria response should be performed 45-60 minutes after the contact of allergen with the skin [13]. This duration can be extended to 1 hour if NICU is suspected. A positive response in contact urticaria consists of edema and/or erythema [6].

The test substances for the rubbing test are prepared as in the open test and are applied by rubbing with a finger or cotton swab 15–20 times to increase the absorption. Dermographism should be tested before the rubbing procedure and the test should not be performed with latex gloves. The evaluation is performed 15–20 minutes after the test substances are removed [13].

The short-term patch test can be used to prevent the contact urticarial factors from spreading or drying. In the closed test method, the patch test sites are opened after 20 minutes and the urticarial reaction evaluated [13].

The prick test demonstrates the presence of specific tissue IgE against the allergen. It is used in the diagnosis of immunologic contact urticaria [13]. Commercial antigens in 2–3 ml bottles are used for the test. The test can be conducted on the skin of the inner surface of the forearm or the back. The evaluation is performed 15–20 minutes after the contact of the allergen with the skin. However, the test should be finalized early in case of severe reaction development. The most important point during the test is to use a separate lancet for each allergen and to apply the allergens 2 cm away from each other [13].

After a superficial scratch of 5–10 mm is formed with the lancet, the test substance is applied to the scratch and evaluation is performed 5–20 minutes later [13].

In the closed scratch test, the test substance is applied similarly and then covered. The evaluation of the test is performed 20 minutes later [13].

It is possible to use histamine hydrochloride as a positive control and aqueous sodium hydroxide as a negative control for the prick and scratch tests.

The radioallergosorbent test (RAST) measures specific IgE in the serum. It can be used for the diagnosis of ICU and CUS and also detect cross-allergenicity [16].

If a strong early reaction is suspected, the first step should be specific IgE measurement and it should be followed by non-invasive skin tests (open test-rubbing test and close test) and invasive skin tests (prick test, scratch test and closed scratch test) at the final stage [13]. Besides specific IgE measurement, open test should be used first when a direct puncture test is risky in latex allergy. It should not be forgotten that latex can cause cross-react with fruits, vegetables and seafood, plants and pollen while latex allergy is evaluated [18–21].

It is necessary to discontinue H1 antihistamines for 1 week, H2 antihistamines for 1 day, steroids (if used for longer than 1 week) for 1–3 weeks and phototherapy for a couple of weeks before skin tests [13, 35]. The possibility of an anaphylactic reaction should be considered during skin tests. All skin tests should therefore be conducted in the special clinic where the proper and necessary equipment are available.

5. Prevention and treatment

The first step in the treatment is to avoid and eliminate the allergen. Identification of the allergens is therefore the main step of the treatment [36].

The secretion of histamine and other mediators from mast cells should be prevented to decrease symptoms. The first treatment step consists of 2nd generation H1 antihistamines. The antihistamine dose can be increased if there is no benefit at first. In addition to oral antihistamines, systemic steroid treatment can also be used in severe cases. Conducting the treatment in units where resuscitation can be performed is appropriate for anaphylaxis and anaphylactic shock cases [6].

Author details

Isil Bulur[1]* and Hilal Gokalp[2]

*Address all correspondence to: isilbulur@yahoo.com

1 Department of Dermatology, Memorial Şişli Hospital, Istanbul, Turkey

2 Department of Dermatology, Koç University School of Medicine, Istanbul, Turkey

References

[1] Fisher AA. Contact Dermatitis, 2nd ed. Philadelphia: Lea & Febiger, 1973.

[2] Gomułka K, Panaszek B. Contact urticaria syndrome caused by haptens. Postepy Dermatol Alergol 2014;31:108–112. doi: 10.5114/pdia.2014.40915.

[3] Greaves MW. Pathology and classification of urticaria. Immunol Allergy Clin North Am 2014;34:1–9. doi: 10.1016/j.iac.2013.07.009.

[4] Wakelin SH. Contact urticaria. Clin Exp Dermatol 2001;26(2):132–136.

[5] Giménez-Arnau A. Contact urticaria and the environment. Rev Environ Health 2014;29:207–215. doi: 10.1515/reveh-2014-0042.

[6] Gimenez-Arnau A, Maurer M, De La Cuadra J, Maibach H. Immediate contact skin reactions, an update of contact urticaria, contact urticaria syndrome and protein contact dermatitis—"a never ending story". Eur J Dermatol 2010;20:552–562. doi: 10.1684/ejd.2010.1049.

[7] Bhatia R, Alikhan A, Maibach HI. Contact urticaria: present scenario. Indian J Dermatol 2009;54:264–268. doi: 10.4103/0019-5154.55639.

[8] Maibach HI, Johnson HL. Contact urticaria syndrome. Contact urticaria to diethyltoluamide (immediate-type hypersensitivity). Arch Dermatol 1975;111:726–730.

[9] von Krogh G, Maibach HI. The contact urticaria syndrome—an updated review. J Am Acad Dermatol 1981;5:328–342.

[10] Bourrain JL. Occupational contact urticaria. Clin Rev Allergy Immunol 2006;30:39–46. doi: 10.1385/CRIAI:30:1:039.

[11] Amin S, Tanglertsampan C, Maibach HI. Contact urticaria syndrome: 1997. Am J Contact Dermat 1997;8:15–19.

[12] Nicholson PJ, Llewellyn D, English JS. Guidelines development group. Evidence-based guidelines for the prevention, identification and management of occupational contact dermatitis and urticaria. Contact Dermatitis. 2010;63:177–186. doi: 10.1111/j.1600-0536.2010.01763.x.

[13] Lachepelle J-M, Maibach HI. The methodology of open (non-prick) testing, prick testing, and its variants. In Patch Testing and Prick Testing A Practical Guide, edited by Lachpella J-M, Maibach HI, 2nd ed. Berlin: Springer Verlag, 2009:141–152.

[14] Wu M, McIntosh J, Liu J. Current prevalence rate of latex allergy: why it remains a problem? J Occup Health 2016;58:138–144. doi: 10.1539/joh.15-0275-RA.

[15] Wagner S, Breiteneder H. Hevea brasiliensis latex allergens: current panel and clinical relevance. Int Arch Allergy Immunol 2005;136:90–97. doi: 10.1159/000082938.

[16] Wang CY, Maibach HI. Immunologic contact urticaria—the human touch. Cutan Ocul Toxicol 2013;32:154–160. doi: 10.3109/15569527.2012.727519.

[17] de Lagrán ZM, de Frutos FJ, de Arribas MG, Vanaclocha-Sebastián F. Contact urticaria to raw potato. Dermatol Online J 2009;15:14.

[18] Blanco C, Carrillo T, Castillo R, Quiralte J, Cuevas M. Latex allergy: clinical features and cross-reactivity with fruits. Ann Allergy 1994;73:309–314.

[19] Wagner S, Breiteneder H. The latex-fruit syndrome. Biochem Soc Trans 2002;30:935–940. doi: 10.1042/bst0300935.

[20] Fuchs T, Spitzauer S, Vente C, Hevler J, Kapiotis S, Rumpold H, Kraft D, Valenta R. Natural latex, grass pollen, and weed pollen share IgE epitopes. J Allergy Clin Immunol 1997;100:356–364.

[21] Kim KT, Hussain H. Prevalence of food allergy in 137 latex-allergic patients. Allergy Asthma Proc 1999;20(2):95–97.

[22] Amaro C, Goossens A. Immunological occupational contact urticaria and contact dermatitis from proteins: a review. Contact Dermatitis 2008;58:67–75. doi: 10.1111/j.1600-0536.2007.01267.

[23] Davari P, Maibach HI. Contact urticaria to cosmetic and industrial dyes. Clin Exp Dermatol 2011;36:1–5. doi: 10.1111/j.1365-2230.2010.03854.

[24] Williams JD, Lee AY, Matheson MC, Frowen KE, Noonan AM, Nixon RL. Occupational contact urticaria: Australian data. Br J Dermatol 2008;159:125–131. doi: 10.1111/j.1365-2133.2008.08583.

[25] Kanerva L, Toikkanen J, Jolanki R, Estlander T. Statistical data on occupational contact urticaria. Contact Dermatitis 1996;35:229–233.

[26] Niinimäki A, Niinimäki M, Mäkinen-Kiljunen S, Hannuksela M. Contact urticaria from protein hydrolysates in hair conditioners. Allergy 1998;53:1078–1082.

[27] Poltronieri A, Patrini L, Pigatto P, Riboldi L, Marsili C, Previdi M, Margonari M, Marraccini P. Occupational allergic "march". Rapid evolution of contact dermatitis to ammonium persulfate into airborne contact dermatitis with rhinitis and asthma in a hairdresser. Med Lav 2010;101:403–408.

[28] Ortolani C, Ispano M, Pastorello E, Bigi A, Ansaloni R. The oral allergy syndrome. Ann Allergy 1988;61:47–52.

[29] Konstantinou GN, Grattan CE. Food contact hypersensitivity syndrome: the mucosal contact urticaria paradigm. Clin Exp Dermatol 2008;33:383–389. doi: 10.1111/j.1365-2230.2008.02893.x.

[30] Kelso JM. Pollen-food allergy syndrome. Clin Exp Allergy 2000;30(7):905–907.

[31] Miranda-Romero A, Navarro L, Pérez-Oliva N, González-López A, García-Muñoz M. Occupational heat contact urticaria. Contact Dermatitis 1998;38:358–359.

[32] Bourrain JL, Amblard P, Béani JC. Contact urticaria photoinduced by benzophenones. Contact Dermatitis 2003;48:45–46.

[33] Yamazaki S, Katayama I, Kurumaji Y, Yokozeki H, Nishioka K. Contact urticaria induced by mexiletine hydrochloride in a patient receiving iontophoresis. Br J Dermatol 1994;130:538–540.

[34] Katsarou A, Armenaka M, Ale I, Koufou V, Kalogeromitros D. Frequency of immediate reactions to the European standard series. Contact Dermatitis 1999;41:276–279.

[35] Bernstein IL, Li JT, Bernstein DI, Hamilton R, Spector SL, Tan R, Sicherer S, Golden DB, Khan DA, Nicklas RA, Portnoy JM, Blessing-Moore J, Cox L, Lang DM, Oppenheimer J, Randolph CC, Schuller DE, Tilles SA, Wallace DV, Levetin E, Weber R, American Academy of Allergy, Asthma and Immunology, American College of Allergy, Asthma and Immunology. Allergy diagnostic testing: an updated practice parameter. Ann Allergy Asthma Immunol 2008;100(Suppl 3):1–148.

[36] Zuberbier T, Asero R, Bindslev-Jensen C, et al. EAACI/GA2LEN/EDF guideline: management of urticaria. Allergy 2009;64:1427–1443. doi: 10.1111/j.1398-9995.2009.02178.x.

IntechOpen