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ALLERGIC CONTACT DERMATITIS TO COSMETICS: A LITERATURE REVIEW

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Abstract: Contact dermatitis (CD) is an inflammatory reaction of the skin, mainly manifested by eczema-like lesions due to exposure to external agents. This condition can manifest itself after the first contact with the causative agent or develop gradually with repeated exposure. Among the main triggers of contact dermatitis are substances present in cosmetics, external products used to protect, cleanse or beautify the body. Initial treatment involves identifying and eliminating the causative agent, as well as using appropriate medication. CD affects people of all ages and can have a significant impact on quality of life. This literature review aims to identify the cosmetics and substances that most frequently cause contact dermatitis, as well as describing the clinical characteristics, diagnosis and treatment of allergic contact dermatitis. The research will be carried out through a systematic review of books, dissertations and scientific articles from the last five years, using databases such as Scielo, PubMed and Google Scholar, with the descriptors "allergic contact dermatitis", "additives in cosmetics" and "contact eczema", based on DeCS. Repeated, incomplete or non-relevant articles will be excluded in order to guarantee the quality and relevance of the information.
Keywords: allergic contact dermatitis; cosmetic additives and contact eczema.

INTRODUCTION

Contact dermatitis is an inflammatory skin disease resulting from exposure to substances that are harmful to the skin and can cause irritation or allergies.[1]

There are two types of contact dermatitis, which have different causes and pathophysiological mechanisms: primary irritant contact dermatitis (PPICD) and allergic contact dermatitis (ACD). ACD can present in three ways: acute, subacute and chronic. Allergic contact dermatitis (ACD) is a classic exam-

ple of type IV hypersensitivity of the Gell and Coombs classification, which is cell-mediated. In this type of dermatitis, the immune system is primarily responsible for the inflammatory process on the skin, which can take from a few days to years to develop, depending on the causative agent.[2]

Among the substances that can cause contact dermatitis, we can mention cosmetics, which are the main objective of this study. Cosmetics are formulations that contain a wide variety of raw materials, whether natural or synthetic, and can have various applications in the human body. These products are used to care for the skin and hair, with the aim of providing protection, cleansing, or beautification such as fragrances, make-up, among other aesthetic benefits[3]. Therefore, as cosmetics are part of the daily life of the world's population, it is extremely important for health professionals to study active ingredients and cosmetic formulations in order to minimize the occurrence of allergic reactions such as ACD in patients, as well as knowing how to manage the condition.[4]

It is known that the repercussions of using cosmetics are more common in irritant dermatitis, however, allergic contact dermatitis represents 1% of reactions, varying according to the region and number of exposures to the cosmetic. Thus, ACD can occur at the site of direct application of the product, or in other areas where it can be transferred, such as when using towels, telephones and even through the air and interpersonal contact.[5]

The etiological agents of ACD are chemical substances that are not very complex, such as mineral or organic elements or compounds, known as haptens. Some of these haptens are particularly sensitizing and can cause allergic reactions even in small quantities.[2]

Among the main substances present in cosmetics are resin toluene sulfonamide formaldehyde (R-TSF), paraphenylenediamine, methylisothiazolinone with methylchlortiazolinone (Kathon CG), perfume mix1, formaldehyde, rosin, turkey balsam, parabens, irgasan, ammonium thioglocolate, quaternium 15, hydroquinone, triethanolamine, butylated hydroxytoluene (BHT), lanolin, 2-bromo-2-nitropropane-1,3-diol (Bronopol), chloracetamide, amerchol L 101, propylene glycol, sorbic acid, imidazolinidyl urea (ImU), chlorhexidine. These agents are found in nail polish, hair dyes, perfumes, shampoos and hair products, creams and moisturizers, deodorants, sunscreens and soaps).[5]

The clinical presentation of allergic contact dermatitis is variable and mainly includes eczema with the presence of erythema, edema, as well as vesicles, exudates and papules, or chronically desquamation, lichenification, hyperkeratosis and fissures, most of which are accompanied by itching.[6]

The diagnosis of ACD is based on anamnesis, dermatological physical examination and contact testing. In the anamnesis, it is common for the patient to question the diagnosis, as they may have used the product causing the allergy without previously showing symptoms. In the physical examination, morphotopography (localization of the lesions) is a useful diagnostic tool, and can help identify the allergen responsible for the lesion on the skin and eventually, the lesions can appear in places far from the original site, due to the spread of the allergen.[2]

The contact test is the most effective method for diagnosing ACD and is indicated for acute or chronic, pruritic, eczematous or lichenified dermatitis, in which allergic contact dermatitis is suspected[7]. In addition, patients with other skin conditions that may be aggravated by allergic contact dermatitis, such as atopic dermatitis, seborrheic or stasis dermatitis, nummular eczema, psoriasis and dyshidrosis are also considered part of the differential diagnosis of ACD. The test is contraindicated

for patients with acute generalized dermatitis and extensive eczema on the back until the disease is under control. A positive result, together with the relevant clinical findings, leads to appropriate management of ACD and provides well-being for the patient.[8]

With regard to the treatment of allergic contact dermatitis, the initial approach is to identify the offending agent and remove it. For drug treatment, symptomatic drugs such as antihistamines and immunosuppressive drugs such as corticosteroids, cyclosporines, pentofilixin and FK 506 (immunosuppressive macrolide) are generally recommended.

Oral antihistamines can help control pruritus, but are not effective against secondary infections, which should be treated with antibiotics, preferably systemically, as topical antibiotics can sensitize the skin. In more severe cases, topical corticosteroids in cream form can be used and, in extensive cases, oral use may be necessary. To reduce symptoms, prednisone can be indicated at a dose of 1mg/kg/day for five days, with gradual dose reduction and maintenance for 10 to 14 days. It is important to maintain treatment for at least 10 days, as studies show that the allergen can remain on the skin for several days.

To treat acute eczema, you can use moist compresses with potassium permanganate diluted 1:40,000 to 1:60,000, Burrow's fluid or Alibour water in a ratio of 1/10 or 1/20. And to treat subacute eczema, it may be necessary to use creams containing corticoids and antihistamines for systemic use. Finally, for chronic eczema, the use of ointments containing corticosteroids is recommended. In specific cases, occlusive corticosteroids may be indicated. For lesions with chronic lichen simplex, intralesional infiltrations with triamcinolone may be necessary. Phototherapy with UVB can also be used to block the induction of allergic contact dermatitis.[9]

Finally, allergic contact dermatitis is among the most common dermatoses in industrialized countries and, with the advancement of the cosmetics industry, more information about the disease is essential. The symptoms of ACD, such as itching, pain and exudation, can negatively affect the patient's social and professional life and rest. By discovering the agent responsible for this dermatitis, it is possible to modify the evolution and prognosis of the disease, directing treatment and resulting in a significant improvement in quality of life.[10]

METHODOLOGY

A descriptive literature review was carried out between 2018 and 2024 with a qualitative approach. The research included works from the last 5 years, by reviewing books, dissertations and scientific articles available in databases such as Scielo, PubMed and Google Scholar. The descriptors used for selection were: Allergic Contact Dermatitis; Cosmetic Additives and Contact Eczema, based on the Health Sciences Descriptors (DeCS). To add the articles to this study, the following criteria were used: title of the article containing the theme; articles in English, Spanish and Portuguese; systematic reviews; integrative reviews; multicenter studies; clinical studies; articles published in the aforementioned databases between 2018 and 2024. Initially, the title and abstract of the articles were read, and those considered relevant for inclusion were read in full. The reference lists of the selected articles were consulted, and those that proved relevant to this study were also added. Criteria were used to exclude articles, such as: repeated articles, incomplete articles and articles that did not represent the theme. Evaluations and compilations of the data obtained by reading the selected articles were organized in Microsoft Word tables, allowing them to be observed, described and categorized. These

AUTHOR	CAUSATIVE AGENT	RESULT
6. Goes HF. Pro-inflammatory and regulatory mechanisms in allergic contact dermatitis to methylchloroisothiazolinone and methylisothiazolinone [dissertation]. São Paulo: University of São Paulo; 2019.	Isothiazolinones	Isothiazolinones are preservatives found in water-based products such as creams, lotions, shampoos and wet wipes. As a result, allergic contact dermatitis caused by this substance mainly affects the face and hands in adults, and the perioral region, genitals and buttocks in children, due to its presence in wet wipes.
11. Fransway AF, Fransway PJ, Belsito DV, Warshaw EM, Sasseville D, Fowler Jr JF, et al. Parabens. Dermatitis. 2019;30:3-31. doi: 10.1097/DER.0000000000000429.	Parabens	Parabens have been widely used as preservatives in cosmetics, food and by the pharmaceutical industry for over 70 years, and is the safest and cheapest preservative agent on the market. It is present in most cosmetic products, toothpastes, cleaning products and food. However, some patients show a reaction to this substance, and in the American group's studies, the frequency of sensitization varies between 0.6 and 2.3%.
	Toluene-sulfonamide-formaldehyde resin (R-TSF)	It is currently the most widely used resin in nail polish, responsible for the shine, resistance and durability of the polish after application. In a study carried out between 2004 and 2017, this substance was found to be the main allergen causing CAD, among the cases analyzed
12. Milam EC, Jacob SE, Cohen DE. Contact dermatitis in the patient with atopic dermatitis. J Allergy Clin Immunol Pract. 2019 Jan;7(1):18-26. doi: 10.1016/j.jaip.2018.11.003. PMID: 30598176.	Propylene glycol	It is a synthetic alcohol that has emollient, solvent, antimicrobial and emulsifying properties. It is used in many cosmetics, personal care products, medicines (such as topical corticosteroids), foods, and recently, in electronic cigarettes. CAD caused by this substance ranges from 0.8 to 3.5% of cases.
	Paraphenylene-diamine (PPDA)	A substance present in hair dyes, it can cause intense and severe reactions on the scalp and can also affect the face, eyebrows, neck and ears. It can also be present in henna tattoos, causing sensitization in the tattoo area.
	Ammonium Thioglycolate	An agent used in hair straightening, it can account for up to 3% of cases of allergic contact dermatitis caused by cosmetics.
	Formaldehyde	It is an antiseptic used as a preservative in cleaning products, cosmetics and topical medicines. It is also well known on the market as a hair straightening product which, despite being banned by Anvisa, is still used informally. Sensitization caused by this substance is 2-3% in Europe, and 8-9% in the United States.
	Fragrances (Perfume Mix 1)	There are several fragrances on the market, and they represent the most common allergens in cosmetics, accounting for 30-40% of allergy cases. In this study, only Perfume Mix 1 was analyzed, composed of cinnamic alcohol, cinnamic aldehyde, hydroxycitronellal, amylcinnamaldehyde and geraniol, which accounted for 16.4% of the positive tests for allergy to cosmetics.
	Peruvian balsam	It is a natural resin made up of more than 250 substances, used as a fragrance fixative. In this study, it accounted for 6% of sensitization cases.
13. Hafner MFS, Munhoz SDG, Jeldes AG, Lazzarini R. Positive results of patch tests with fragrance markers: analysis of a 15-year period at a Brazilian dermatology center. An Bras Dermatol. 2018;93:910-2. doi: 10.1590/abd1806-4841.20187743.	Fragrances	They are used to give or intensify the fragrance of a product. They are widely used in flavorings, cleaning products, toys, topical medicines and especially cosmetics. Studies have shown that fragrances are among the main sensitizers, affecting 1% of the population. Allergic contact dermatitis caused by this agent can result from the direct application of the product to the skin or mucous membranes, through fomites such as pillows, perfumed clothing, through contact with products used by other people, such as cosmetics used by partners, as well as airborne exposure, through perfumes, or systemic exposure, through food aromas.

14. Oliveira A, Almeida F, Caldas R, Pereira T, Brito C. Allergic contact dermatitis to rosin in a graphic printing operator - clinical case. Rev Port Saúde Ocup. 2020;10:1-8. DOI: 10.31252/RPSO.16.10.2020.	Rosin	It is a resin of plant origin, made up of a complex mixture of more than one hundred compounds, and has numerous applications at home and at work, such as in varnishes, adhesives, synthetic rubbers, cosmetics, food products, soaps, detergents, among others, and its exposure is practically universal. The article in question reports a case of allergic contact dermatitis to rosin in a professional context, with erythematous and desquamative lesions located on the back and sides of the hands, which worsened during work.

Table 1 - Allergic contact dermatitis caused by different agents, according to different authors.

Source: Autoral

strategies were used to ensure the selection of the most relevant and up-to-date articles on the proposed topic, guaranteeing the quality and reliability of the expected research results.

RESULTS

The results obtained from reading articles on the general subject were organized in a table, containing the source, the main substances that cause allergic contact dermatitis, as well as the cosmetics in which these substances are found and the result obtained from each article.

DISCUSSION

In light of what was found in the literature, it can be seen that there are few up-to-date articles on allergic contact dermatitis to cosmetics, most of which date from before 2018. Among the findings included in this study, it can be seen that the main articles highlight the presence of various allergenic chemical substances that cause allergic contact dermatitis, mainly through case reports.

As noted in the selected articles, any constituent of a cosmetic can cause an allergic contact reaction. It is estimated that an adult uses between 6 and 12 cosmetic products every day. In a study carried out in the UK, 57% of women and 31% of men reported having already had an adverse reaction to using a cosmetic[11]. In addition, many of the sensitizing agents present in cosmetics are also present in products used on a daily basis by the world's population, such as cleaning products, hygiene products and even food.

Among the known substances that cause allergic contact dermatitis and are included in contact tests, there are some that stand out because they appear more frequently, such as fragrances, preservatives and paraphenylenediamine (PPDA).

Fragrances are used to give or intensify the fragrance of products used in cosmetics, including perfumes, shampoos, conditioners, moisturizing creams, facial cosmetics and deodorants and account for 30-40% of cosmetic allergy cases[5]. Among the fragrances included in the contact tests available in Brazil are mix 1 (cinnamic alcohol, cinnamic aldehyde, hydroxycitronellal, amyl-cinnamaldehyde, geraniol (eugenol, isoeugenol and oakmoss absolute), Balsam of Peru and Colofonia. However, there are more than 3,000 fragrances that have already been described and are not addressed in contact tests, which can make it difficult to diagnose these sensitizers. In addition, the lack of information about the actual composition of the products also hinders or delays correct diagnosis.[13]

Preservatives are substances added to products with the aim of inhibiting the growth of microorganisms, increasing the product's shelf life and are among the main agents causing allergic contact dermatitis. These include parabens, isothiazolinones, especially methylisothiazolinone, and formaldehyde. Parabens are used as preservatives in cosmetics, cleaning and hygiene products and even in food and have been the cheapest and safest

preservative on the market since 1924. However, they can still cause sensitivity in some patients, at a frequency of between 0.6 and 2.3% in an American study group.[11]

Isothiazolinones represent the highest frequency of sensitization among preservatives, especially methylisothiazolinone. It is a preservative used in water-based products such as creams, lotions, self-tanning creams, shampoos and wet wipes, but can also be used in industrial products such as wall paints, oils, glues, textiles and leather. As the use of this preservative in industry has increased, so have the cases of sensitization, mainly due to its use in cosmetics. Between 2006 and 2012, there was an increase in sensitization from 3.35% to 11.14%[16]. As a result, the European Commission's Scientific Committee for Consumer Safety recently banned the use of methylisothiazolinone in rinse--off products and restricted its use in rinse-off products. In Brazil, health legislation allows the use of this preservative in cosmetics at a concentration of up to 100 ppm.[17]

Formaldehyde is a preservative, disinfectant and antiseptic widely used in cleaning products, cosmetics, topical medicines, the textile industry and the chemical industry. In cosmetics, it is widely used in nail polish, make-up, antiperspirants, shampoos, creams, bath oils, and is well known for its use as a hair straightening product, which despite being banned by Anvisa, is still widely used informally. Reactions to this allergen depend on the type of exposure, but in addition to skin reactions, formaldehyde gas can cause burning sensations in the eyes, nose and throat, as well as fatigue and headaches. The frequency of formaldehyde sensitization in Europe is around 2-3% and in the United States and Brazil it is 8-9%.[13]

Paraphenylenediamine (PPDA) is a chemical substance widely used in permanent and semi-permanent hair dyes and henna tattoos. PPDA is the component of hair dyes with the highest prevalence of allergic contact dermatitis in both users and hairdressers. Skin manifestations begin to appear 24 to 72 hours after contact with the substance in previously sensitized patients and 4-14 days in those exposed for the first time. In the European population in general, contact dermatitis due to PPDA ranges from 0 to 1.5%, but this percentage is considered underdiagnosed. In a study carried out by Hafner et al, PPDA was the second main substance studied causing allergic contact dermatitis, representing 54 positive tests among 232 patients with cosmetic ACD.

CONCLUSION

Allergic contact dermatitis to cosmetics is a clinical condition with a high incidence and impact on the lives of individuals and society. Increasingly, the world's population is continually exposed to numerous chemical substances, both irritating and allergenic, present in cosmetics used daily for cleaning, protection and beautification, causing skin sensitization. ACD accounts for around 1% of skin reactions and significantly affects the patient's quality of life.

The review carried out revealed the presence of various substances included in cosmetics and in various products used on a daily basis, which can be sensitizing and cause ACD. It is therefore concluded that it is necessary to identify the presence of these substances in the various cosmetics used by patients, as well as the importance of contact tests to verify which substance is responsible for allergic contact dermatitis. Furthermore, it is of the utmost importance to engage health professionals, the industry and regulatory agencies in order to guarantee the quality of the cosmetics available, and to avoid the use of sensitizing substances as much as possible, with a view to prevention and guidance for patients, before the unwanted onset of symptoms and signs of the disease.

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