

ATOPIC DERMATITIS – THE IMPACT OF LIFESTYLE ON THE COURSE OF THIS DISEASE

Atopowe zapalenie skóry – wpływ stylu życia na przebieg choroby

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A – Koncepcja i projekt badania, B – Gromadzenie i/lub zestawianie danych, C – Analiza i interpretacja danych, D – Napisanie artykułu, E – Krytyczne zrecenzowanie artykułu, F – Zatwierdzenie ostatecznej wersji artykułu

Abstract (in Polish):

Atopowe zapalenie skóry (AZS) to przewlekła, nawrotowa choroba skóry. Istotny jest fakt, iż choroby alergiczne rozwijają się u osób z predyspozycją genetyczną. Celem artykułu było przedstawienie podstawowej wiedzy o tej chorobie, czynnikach zaostrzających jej przebieg oraz możliwości identyfikacji i eliminacji czynników sprawczych, gdyż skuteczne leczenie tego przewlekłego schorzenia jest zależne od zrozumienia istoty choroby.

Uważa się, że wzrost zachorowalności na alergię wynika z tzw. „zachodniego stylu życia”. Zwraca się uwagę na czynniki psychosomatyczne, które mogą nasilać objawy chorobowe. Duże znaczenie w powstawaniu atopowego zapalenia skóry, ale również w prowokowaniu zaostrzeń objawów, przypisuje się czynnikom środowiskowym, do których zalicza się warunki klimatyczne, które bezpośrednio wpływają na barierę skórno-naskórkową poprzez temperaturę, stopień wilgotności powietrza czy nasłonecznienie. Rolę przypisuje się również zanieczyszczeniu środowiska. Warunki klimatyczne mają wpływ na rozwój potencjalnych alergenów. W literaturze istnieją również doniesienia o współwystępowaniu glutenezależnej enteropatii u pacjentów z atopowym zapaleniem skóry. Istnieją przesłanki do wprowadzenia diety antyhistaminowej, gdyż histamina ma znaczenie w patomechanizmie świądu.

Wnikliwa ocena dzieci chorych na AZS może być pomocną bronią w walce z chorobą. Odpowiednia dieta

osób dotkniętych AZS może być więc ważnym elementem terapii leczniczej.

Abstract (in English):

Atopic dermatitis (AD) is a chronic and recurrent skin disease. It is important that allergic diseases occur among people with a genetic predisposition. The aim of the article was to present basic knowledge about this disease, factors aggravating its course and the ability of medics to identify and eliminate causal factors because effective treatment of this chronic disease depends on the understanding of the disease's nature. It is believed that the increase in the incidence of allergies is also connected with the so-called "western lifestyle". Psychosomatic factors may intensify disease symptoms. Great importance in the formation of atopic dermatitis and provoking exacerbations of symptoms is attributed to environmental factors, which include climatic conditions. These conditions directly affect the skin-epidermal barrier via temperature, degree of humidity or sunlight. A significant role is also attributed to environmental pollution. Climatic conditions affect the development of potential allergens. There are also reports in the literature about the coexistence of gluten-dependent enteropathy among patients with atopic dermatitis. Moreover, there are grounds to introduce an antihistamine diet because histamine is important in the pathomechanism of itching.

In-depth assessment of children with AD can be a helpful weapon in the fight against the disease. Appropriate diet of people with AD can be an important element of therapy.

Keywords (in Polish):

atopowe zapalenie skóry, styl życia, dieta.

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Atopic dermatitis, lifestyle, diet.

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ATOPOWE ZAPALENIE SKÓRY

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Introduction

Atopic dermatitis (AD) is a chronic and recurrent disease. It is an inflammatory skin disease that usually begins in early childhood. Many factors have impact on the course of AD. This disease is charac-

terized by polygenic inheritance. Atopic predisposition modified in the course of life by environmental factors is inherited [1].

Genes responsible for the development of atopy encode: cell receptors, immune chains, cytokines and transcription factors. The polymorphism of these genes has been described in patients suffering from AD. This can decisively change the quality and severity of the immune response. The activity of cytokine production or expression of receptors on various cells is changing. This promotes a change in the immune response and its orientation towards an atopy response (IgE overproduction) [2]. In literature, most attention is paid to the multidirectional role of filaggrin (FLG) in the functioning of the epidermal barrier. Attention Researchers focus on polymorphism of a filaggrin gene (1q21), which decides about the congenital defect of the epidermal barrier. In the case of patients with atopic dermatitis, who have mutations in filaggrin genes, it has been demonstrated that both the clinical image and the course of the disease are different compared to patients without this mutation. In the case of atopic dermatitis patients with a mutation in the FLG gene, the severity of dry skin is definitely stronger, first symptoms appear earlier, the course of disease is more chronic and there are frequent clinical symptoms of asthma, food allergies and secondary bacterial skin infections [3].

The body of patients with atopic dermatitis has a predisposition to produce IgE-dependent hypersensitivity to external and internal antigens in the first and fourth mechanism of immune response. It is recognized that approx. 80% of patients have the increased levels of IgE antibodies. Specific IgE for popular inhaled and food allergens can be detected in the majority of them. Inhaled and food allergens easily penetrate mucous membranes and get into skin through the bloodstream. They provoke eczema lesions. Patients with AD have functional failure of the epidermal barrier. Allergens can easily move from the skin surface to its deeper layers. Then, with the help of antigen presenting cells, they stimulate sensitized memory lymphocytes. Additionally, the majority of patients with atopic dermatitis have circulating IgE directed against own proteins. The presence of such antibodies partly explains a chronic and recurrent nature, as well as difficult identification of allergens provoking skin lesions in many patients. Another phenomenon observed in the examined patients is a polyclonal response to bacterial or fungal superantigens. Unfortunately, they often colonize patients' skin. Superantigens do not need to be present by Langerhans cells and they are able to stimulate a large part of lymphocyte population via a non-specific receptor. *Staphylococcus aureus*, *Candida albicans* and *Malassezia furfur* constitute a pathogen that usually causes this phenomenon. Furthermore, patients may have contact allergy, especially to nickel and components of external medicines [4].

The defect of epidermal barrier detected in patients with AD is also genetically conditioned. It is associated with the occurrence of many irregularities in the composition and function of epidermis. The consequences of this condition include: excessive transepidermal water loss (TEWL), dry skin, lowered itch threshold, high sensitivity to non-specific irritants, tendency to development of inflammation or increased penetration of potential allergens and irritants. Attention is drawn to the fact that these phenomena may be the primary cause of exacerbations. Additionally, it is emphasized that patients suffering from atopic dermatitis have abnormalities in the normal production of the lipid layer of the stratum corneum. The reason is mainly poor enzymatic activity. These abnormalities lead, among others, to a shortage of ceramides in the stratum corneum, in particular ceramide 1 and 3. These compounds play a very important role in the maintenance of epidermal homeostasis. They are responsible for the maintenance of water in the epidermis. Furthermore, they participate in the regulation of the activity of the intracellular transmission system. Their deficiency causes constant stimulation of keratinocytes and the secretion of large amounts of proinflammatory cytokines. A natural moisturizing factor (NMF) is in the stratum corneum. It consists

of proteins, amino acids and urea. Deficiency of urea in atopic skin also contributes to its excessive drying and increased transepidermal water loss [4].

The aim of the article was to present basic knowledge about this disease, factors aggravating its course and the ability of medics to identify and eliminate causal factors because effective treatment of this chronic disease depends on the understanding of the disease's nature.

The impact of lifestyle on the course of this disease

It is indisputable that allergic diseases occur in people with a genetic predisposition. However, it is believed that the increase in the incidence of allergies is also connected with the so-called "western lifestyle". It is associated with a small family, increased hygiene regime, change in eating habits, more frequent use of antibiotics and reduction in the incidence of childhood infectious diseases. The current macrobiotic theory assumes that intestinal microbiota (formerly called intestinal microflora), i.e. microorganisms inhabiting the human digestive tract, is essential for processes that regulate immunity and immune tolerance to external antigens [4]. It is believed that a change in its composition can activate the immune system in a proallergic direction. The conducted population research regarding intestinal microbiota in newborns born in highly developed countries, where an increase in allergy is observed, showed its smaller differentiation compared to newborns born in developing countries with a low incidence of allergic diseases (e.g. Pakistan) [5]. In the Polish population, it has been presented that in the group of infants suffering from food allergy and with AD symptoms, there are more children with a low number of *Lactobacillus*, *Bifidobacterium*, *Bacteroides* and *Enterobacteriaceae* type bacteria that in the group of healthy children [6]. According to the definition of the World Health Organization (WHO) and the Food and Agriculture Organization (FAO), probiotics are live microorganisms, which (when administered in adequate doses) present a beneficial effect for health [7]. Probiotics that have found clinical use in allergic diseases belong to the genus *Lactobacillus*, *Bifidobacterium* and species of *E. coli* [8].

The first study, in which it was shown that the supplementation of an infant's diet with the strain of *Lactobacillus rhamnosus* has a positive impact on the course of AD, appeared in 1997 [9]. Since then, many clinical studies have been published. In these studies, treatment of allergies was supported by the administration of probiotics. They may play a moderate role in the treatment of atopic dermatitis in children and adults [9]. However, experts from international allergy associations (World Allergy Organization – WAO) said that, according to the current state of knowledge, there is no scientific basis for the use of probiotics – both in the prevention of allergies and in the supplementation of the AD's treatment [10]. Unfortunately, Szajewska confirms that it is still unknown whether the use of a specific strain is beneficial [11]. WAO recommends the administration of probiotics to pregnant women, nursing women and infants burdened with atopic family history. However, strains adequate for application, doses of strains and duration of supplementation have not been specified [12].

Smoking is another issue. Currently, it is believed that smoking contributes to the intensification of inflammatory processes by increasing the number of free radicals, the number of neutrophils, as well as causing an increase in the activity of autoreactive B lymphocytes and proinflammatory cytokines, especially TNF- α and IL-6. Furthermore, the immunosuppressive effect of smoking is emphasized. It is caused by the inhibition of the process of presenting antigens, and it reduces the innate and acquired immune response, which is connected with increased susceptibility to infections. Exposure to tobacco smoke increases exposure to endotoxins that lead to an increase in IgE concentration. As a result, this promotes the development of atopic diseases. It was observed that both active and passive smoking during pregnancy increases the risk of developing allergic diseases [13].

In the course of AD, several environmental factors are undeniably highlighted. They include climatic conditions that directly affect the skin-epidermal barrier via temperature, degree of air humidity or sunlight.

Therefore, attention should be paid to the limitation of the skin's exposure to sunlight through the use of protective clothing and effective sunscreen preparations with UV filters (with a sufficiently high SPF – sun protection factor). Sunscreen preparations (used in dry skin therapy) should contain moisturizing agents. They should not contain irritating fragrances or dyes.

Children suffering from atopic dermatitis should avoid dry air. For this purpose, time spent outdoors during extremely hot or cold weather should be limited. Rooms, where a child stays, should be ventilated as often as possible, and temperature should not exceed 22-23°C, while sleeping – approx. 18°C. The air humidity should be around 40%. For this purpose, it is advisable to use humidifiers, especially in heated rooms, and avoid air conditioning.

The child should be dressed adequately to the current temperature. Due to the underdevelopment of thermoregulation, clothes that cause overheating with subsequent perspiration should be avoided. A child, who does not walk, should be dressed similarly as an adult with one additional layer, e.g. a blanket. A walking child should be dressed as an adult. Fabrics that drain sweat from the body are preferred. Too tight clothes should be avoided. It is recommended to wear skin-contact clothing made of natural materials that do not irritate the skin – e.g. cotton and silk. Wool materials have irritating properties.

For washing and rinsing child's clothes, it is recommended to use non-irritating skin agents – i.e. agents that do not contain dyes or fragrances (baby powders or soap flakes). In cases of particularly sensitive skin, double rinsing is recommended in order to remove residual detergent. Additional softeners or rinsing liquids should be avoided because they can have a negative impact on the condition of child's skin. You can iron clothes after drying or use a clothes dryer.

Climatic conditions affect the development of potential allergens. A significant role is also attributed to environmental pollution. It was stated that exceeding the set standards for the content of individual chemical compounds in the environment may lead to disorders in the functioning of the immune system. Natural immune mechanisms of the body are damaged, so the penetration of allergens into the human body is facilitated [14].

Of course, the presence of allergens is an environmental factor. The first group consists of airborne allergens. The frequency of hypersensitivity to this group of allergens is 50-90%. Its mechanism is IgE-dependent. Skin lesions may appear immediately (when the allergen comes into direct contact with the skin) or with a delay. The main airborne allergens include: house dust mites, pollen allergens (grass and cereal), allergens of animal, bacterial and fungal origin. A huge role in the pathomechanism of allergic diseases is attributed to house dust mites because these organisms feed on dry and peeled epidermis. Therefore, epidermis in people suffering from AD presents very good conditions for their existence [14].

Pollen allergens (grass and cereal) are a common cause of the occurrence and/or exacerbation of skin lesions among patients. Wind plants, which produce very large amounts of pollen in a short period of time, are the most important factor. Among pollen allergens from shrubs and trees occurring in Poland, the following trees deserve special attention: birch, beech, hornbeam, ash, hazel, alder, oak, poplar, willow and conifers. From weed pollen allergens: mugwort, quinoa and greater plantain [14]. Airborne allergens also include allergens of bacterial and fungal origin. This is particularly true for: *Staphylococcus aureus*, *Pityrosporum orbiculare*, *Candida albicans*, *Cladosporium herbarum* and *Alternaria alternata* [15].

In patients with atopic dermatitis, attention is also paid to allergens of animal origin, especially dogs and cats. Substances with allergen properties are found both in fur, epidermis, as well as in excrements or secretions of animals [14].

Another group consists of food allergens. This mechanism is based on the immediate reaction and the later phase of the IgE-dependent response [15]. Quite frequent co-occurrence of food allergy and AD was observed. This applies more often to patients in developmental age than adults. 20-40% of infants and young children are allergic to: cow's milk proteins, chicken eggs, fish, peanuts, soy and wheat [16].

In the case of the youngest children, the occurrence of skin lesions is most often associated with an allergy to cow's milk and chicken egg. Exacerbation of skin lesions may occur after eating one harmful food product. In a group of older children, adolescents and adults, AD is usually connected with allergy to animal or airborne allergens [17]. However, these patients also react by exacerbation of skin lesions after eating certain foods (rarely cow's milk proteins or eggs). Exacerbation of lesions as a result of "allergic cross-reaction" is more often observed. It is caused by simultaneous allergy to food allergens and plant pollen [16]. Cross-allergy is often a source of diagnostic mistakes. This phenomenon is conditioned by the construction of the so-called major antigens that are recognized by the immune system and stimulate the synthesis of specific as IgE antibodies. Therefore, this type of hypersensitivity usually occurs with the assistance of IgE-dependent mechanism. It occurs when asIgE antibodies (produced against a specific allergen) recognize and bind a similar protein that comes from another source but is very similar or identical in terms of epitopes [18].

There are also indications related to the coexistence of gluten-dependent enteropathy in patients with atopic dermatitis. K. Riss et al. examined the incidence of celiac disease in children with this chronic inflammatory skin disease. They showed four times higher risk of developing this disease in pediatric patients with AD. The authors also emphasized the need to assess the cost-effectiveness of screening among patients with atopic dermatitis for celiac disease in a timely manner in order to prevent long-term complications [18]. The aim of the study conducted by Ciacci et al. was to evaluate the incidence of allergies in a very large group of adults with untreated celiac disease (n=1,044) and their families at the time of diagnosis of this disease (2,752 relatives, 318 spouses). It turned out that atopic dermatitis was three times more common in patients with celiac disease and twice more often among their relatives than among spouses [19]. Obtulowicz et al. described two clinical cases of people suffering from atopic dermatitis. The medical history of the respondents did not clearly indicate the co-occurrence of gluten allergy, but the introduction of a gluten-free diet had an effect on the reduction of disease's symptoms. The authors concluded that the rare occurrence of gastrointestinal complaints in patients with IgE-dependent gluten allergy is the reason for difficulties in diagnosis of this form of allergy [20]. However, Greco et al. suggest that there is no relationship between atopy and celiac disease. They indicate that the majority of studies are based on reported symptoms of allergy, and families of celiac patients may pay more attention to all symptoms, including gastrointestinal symptoms that suggest an allergy [21].

Therefore, appropriate nutrition of people with AD can be an important element of therapy. An elimination diet is recommended. This diet involves excluding all potentially allergenic products from the menu. Thanks to this, you can observe the effect of elimination in the form of improving the skin's condition. In children, cow's milk should be eliminated if it seems to be an allergen. It can be replaced with milk replacers or soy milk. Moreover, it is recommended to limit dairy products. They include yogurt, kefir, buttermilk, cheese, butter or cream. However, attention is drawn to the fact that they may not contain or contain small amounts of lactose – i.e. the main allergen contained in milk because it was used during the fermentation of milk. The effects of the elimination diet are visible after approx. 2-3 weeks. If the exclusion of a given group of products from the menu did not bring any results, you should try to eliminate other products [22]. A certain product can be the cause of atopic eczema, when (as a result of its exclusion from the menu) clinical symptoms disappear or their severity significantly decreases, and the consumption of a given product (again) causes the recurrence of the same symptoms.

Moreover, there are grounds to introduce an antihistamine diet because histamine is important in the pathomechanism of itching. For this purpose, it is not recommended to consume artificial dyes and aromas, cheese, chocolate, margarine, as well as smoked, cured and pickled fish, seafood, spinach, peanuts, cashews, citrus fruits and large amounts of tomatoes and bananas [22].

The literature also draws attention to psychosomatic factors that may exacerbate symptoms of the disease. In stressful situations, the Th2 lymphocyte system may be stimulated by the dysregulation of the cytokine environment. It leads to a reduction in resistance to possible skin infections. The authors note that in the course of the disease, the emotional state plays an important role. It is determined by the stability of the family and relations between all its members. Attention is drawn to the relationship between parents, parent and child, as well as between siblings. Interpersonal relations at work or (in the case of children and young people) at school can be equally important [1].

Primary prevention of atopic dermatitis

When the medical history indicates an atopy, primary prevention of atopic dermatitis is applied. It involves the extension of breastfeeding for 4-6 months. The role of using milk replacers or an elimination diet by a nursing mother has not been proven [2]. Active and passive smoking are prohibited during pregnancy. It is recommended to limit the exposure to strong airborne allergens and use probiotics that prevent gastrointestinal infections, regulate motility and maintain a proper bacterial flora. Thanks to this, probiotics stimulate the immune response, facilitate the production of IgA and prevent against allergic diseases. Probiotics produce organic acids, lower the pH of food, inhibit the growth of pathogenic bacteria and form a tight cover of intestinal villi. Lactic-acid-forming bacteria – *Lactobacillus* (e.g. *L. casei*, *L. reuteri*) and *Bifidobacterium* (e.g. *B. animalis*) – belong to microorganisms with a probiotic effect. Other microorganisms (traditionally included in probiotics) are yeasts – *Sacharomyces boulardii* [23].

Diagnosis of atopic dermatitis

The course of atopic dermatitis is divided into three phases: infancy, childhood and adolescence, as well as adulthood. In the first period up to the age of two, children often suffer from acute inflammation of the skin accompanied with itching. These are papulo-exudative lesions, which are susceptible to secondary superinfection. These lesions are mainly located on the face and distal limbs. Additionally, they appear on ears. In severe cases, they can be disseminated in the area of trunk or the entire body. In the childhood, after the second year of life up to the age of twelve, itching is also characteristic. There are erythematous-papular lesions, well limited – with the type of eczema. They gradually change into lesions with lichenization. Desquamation of fingertips and soles may occur during the prodrome period. There are two forms – generalized and limited. In the first form, lesions cover all body areas. In limited form, lesions are located in elbow and popliteal pits, distal parts of limbs and on the face. In adolescence and adulthood, inflammatory infiltrates with significant lichenization are formed. Chronic lesions are not clearly limited. Itching is also characteristic for them. They can also be very extensive and affect the whole skin [24].

The basis for the diagnosis of atopic dermatitis is the clinical picture. Hanifin and Rajka diagnostic criteria are usually used. They include 4 major criteria and 23 minor criteria (Table 1). The disease is diagnosed when three major and three minor criteria are identified. Itching is a symptom that occurs in all patients, and a positive family history is found in 60% of them. In evaluating the location of skin lesions, differences resulting from the disease's phase should be taken into account. Laboratory diagnostics is based on the detection of irregularities in immunological phenomena. The most commonly used test is

the determination of total concentration of IgE (cIgE) in serum – it is increased in 80% of patients. The gold standard in detection of IgE-dependent allergy is currently connected with skin prick tests (SPT) [1]. Atopy patch tests supplement the diagnosis of atopic dermatitis. Airborne and food allergens can affect the course of the disease by provoking exacerbation of the skin's inflammation [4].

Table 1. Criteria for atopic dermatitis according to Hanifin and Rajka [14]

| Major criteria | Minor criteria |
|---|---|
| <ul style="list-style-type: none"> – itching – chronic, recurrent nature – characteristic morphology of lesions and their locations – individual or family atopic history | <ul style="list-style-type: none"> – dry skin – ichthyosis – immediate skin reactions – increased level of IgE – early age for the occurrence of lesions – susceptibility to recurrent skin infections – non-specific eczema of hands/feet – eczema of nipples – cheilitis – recurrent conjunctivitis – Dennie-Morgan fold – keratoconus – cataract – eye shadows – pityriasis alba – neck fold – itching after sweating – food intolerance – wool intolerance – exacerbations after nervous situations – white dermographism – face erythema – accentuation of hair follicles |

Treatment of the disease

After the occurrence of the first clinical symptoms, proper skin care, elimination or reduction of exposure to sensitizing allergens, career counseling and avoidance of irritants are necessary [2]. Education of the patient in order to prevent exacerbations, including proper skin care, is the primary and the most significant treatment. It is recommended to use moisturizing and oiling preparations, which helps to restore the natural barrier of the skin. Attention is drawn to the use of emollients that contain agonist receptors activated by peroxisome proliferators (PPARs), due to the fact that they activate specific nuclear receptors, thanks to which the synthesis of endogenous lipids is stimulated. They also have anti-inflammatory properties. It is also important to use preparations with urea because they maintain appropriate hydration of the stratum corneum of the skin. Regular use of emollients (3-4 times a day in the active period and then twice a day – permanently) is recommended. Healing baths with natural or mineral oils can be

used. Detergents should not be used. Water should have a body temperature. The duration of such a bath should not be longer than 10-15 minutes. Detergents, shampoos and all cosmetics should have a low pH (close to 5.5). They should contain as little as possible dyes, preservatives, fragrances and other additives. For additional reduction of skin itching, anesthetics such as 3% polidocanol may be used during the bath. After bathing, it is not recommended to rub the skin – it should be gently dried. 15 minutes after bathing, it is recommended to use a moisturizing and oiling agent [25]. When choosing cosmetics, it is important to pay attention to the content of ingredients with the ability to reproduce and restore the correct structure and function of the epidermis. They include vitamins (A, C, K, niacin), minerals, unsaturated fatty acids, antioxidants, plant extracts (*Ginkgo biloba*), phytoestrogens, anti-inflammatory components, e.g. ectoine, which has the ability to reduce the inflammatory process induced by external factors (e.g. UV) [26].

In patients with moderately severe atopic dermatitis, topical preparations with glucocorticosteroids are usually used because they are characterized by strong anti-inflammatory, immunosuppressive and anti-proliferative effect. In conjunction with the use of emollients, they ensure the best method of treatment. They can take the form of ointments, creams, sprays or fluid [27]. Immunomodulatory drugs, including calcineurin inhibitors, pimecrolimus and tacrolimus, are also intended for a topical use. Antihistamines, and more specifically – I generation preparations, are used to reduce night itching. Hydroxyzine, which inhibits the secretion of histamine by the hypothalamus and has a sedative effect, is recommended. It is justified to use local antibiotics: mupirocin and fusidic acid when atopic skin infection is accompanied by bacterial superinfection.

In the case of patients, who do not have any benefits from topical treatment, the following treatments and agents are used: phototherapy and cyclosporin A, methotrexate, azathioprine, mycophenolate mofetil and glucocorticosteroids (systemic). Specific immunotherapy is used in the case of patients with documented IgE-dependent allergy to airborne allergens (manifesting symptoms of allergy with positive results of allergen skin prick tests). Its success is determined by: correct selection of a patient, vaccine composition, chronic (over 5 years) and systemic treatment [27].

Conclusions

In-depth assessment of children with AD can be a helpful tool in the fight against the phenomenon of the atopic march and it can constitute an element in the prevention of exacerbations of skin lesions and symptoms of the respiratory system. Children with atopic dermatitis are a group of high risk. They are exposed to other atopic diseases. Every healthcare worker should be responsible for the education of parents of a child suffering from atopic dermatitis in the scope of basic knowledge about this disease, factors aggravating its course, as well as possibilities of identification and elimination of causative factors because effective treatment of this chronic disease depends on understanding the nature of the disease. The key is cooperation with doctors, in particular with dermatologists, allergists and pediatricians because skin manifestation of this disease is a particularly persistent chronic ailment from an early age of a child's life. It causes problems for the entire family.

References

1. Silny W. Atopowe zapalenie skóry. Poznań: Wyd. Termedia; 2012.
2. Silny W, Baran E, Szepietowski J, et.al. Diagnostic prophylactic and therapeutic guidelines in patients with atopic dermatitis position paper by the task force of the national specialists on dermatology and venereology and allergology. *Przewodnik Lekarski* 2005; 1: 28-49.

3. Czarnecka-Operacz M, Jenerowicz D. Atopowe zapalenie skóry (cz.1). Dylematy teoretyczne. *Dermatologia po Dyplomie* 2016; 4
4. Fal AM. Alergia, choroby alergiczne, astma. Tom II. Kraków: Medycyna Praktyczna; 2011: 301-315
5. Von Mutius E. The rising trends in asthma and allergic diseases. *Clinical & Experimental Allergy* 1998; 28 (suppl.5): 45-49
6. Cukrowska B. Probiotyki w profilaktyce i leczeniu alergii. *Klinika Pediatria* 2007; 1: 70-5
7. Joint FAO/WHO Working group report on drafting guidelines for the evaluation of probiotics in food. London, Ontario, Canada, April 30-May 1, 2002; 1-11.
8. Isolauri E, Rautava S, Salminen S. Probiotics in the development and treatment of allergic disease. *Gastroenterology Clinics of North America* 2012; 41: 747-762
9. Majamaa H, Isolauri E. Probiotics: a novel approach in the management of food allergy. *Journal of Allergy and Clinical Immunology* 1997; 99: 179-185
10. Fiocchi A, Burks W, Bahna SL, et. al. Clinical Use of Probiotics in Pediatric Allergy (CUPPA): A World Allergy Organization Position Paper. *World Allergy Organization Journal* 2012; 5: 148-167
11. Szajewska H. Probiotyki – aktualny stan wiedzy i zalecenia dla praktyki klinicznej. *Medycyna Praktyczna* 2017; 7-8: 19-37
12. Milewska-Wróbel D, Lis-Święty A. Probiotyki w prewencji i leczeniu atopowego zapalenia skóry – co nowego? *Dermatologia po dyplomie* 2019; 02: 34-36
13. Baena-Cagnani CE, Gómez RM, Baena-Cagnani R, Canonica GW. Impact of environmental tobacco smoke and active tobacco smoking on the development and outcomes of asthma and rhinitis. *Current Opinion in Allergy and Clinical Immunology* 2009; 9: 136-140
14. Millan M, Mijas J. Atopowe zapalenie skóry – patomechanizm, diagnostyka, postępowanie lecznicze, profilaktyka. *Nowa Pediatria* 2017; 21(4): 114-122
15. Gliński W, Kruszewski J, Silny W. Postępowanie diagnostyczno – profilaktyczno-lecznicze w atopowym zapaleniu skóry. *Polski Merkuriusz Lekarski* 2004; 17: 3-15
16. Nowicki R, Trzeciak M, Wilkowska A, et.al. Atopowe zapalenie skóry – aktualne wytyczne terapeutyczne. Stanowisko ekspertów Sekcji Dermatologicznej Polskiego Towarzystwa Alergologicznego i Sekcji Alergologicznej Polskiego Towarzystwa Dermatologicznego. *Alergologia Polska* 2016; 3: 18 – 28
17. Schmid-Grendelmeier P, Simon D, Simson HU, Akdis CA, Wüthrich B. Epidemiology, clinical features, and immunology of the “intrinsic” (non-IgE-mediated) type of atopic dermatitis (constitutional dermatitis). *Allergy* 2001; 56 (9): 841-849
18. Aalberse RC. Assessment of allergen cross-reactivity. *Clinical and Molecular Allergy* 2007; 5: 2.
19. Dostępny w Internecie: <https://doi.org/10.1186/1476-7961-5-2> Dostęp: 03.04.2020
20. Obtulowicz K, Waga J, Dyga W. Gluten – mechanizmy nietolerancji, objawy i możliwości lecznicze IgE-zależnej alergii na gluten w świetle aktualnych badań kliniczno-immunologicznych. *Przegląd Lekarski* 2015; 72(12): 747-753
21. Greco L, de Seta L, D’Adamo G, et al. Atopy and coeliac disease: bias or true relation? *Acta Paediatrica Scandinavica* 1990; 79: 670-674
22. Soińska J. Atopowe zapalenie skóry nie tylko u dzieci. *Biuletyn Kwartalnik Okręgowej izby pielęgniarek i położnych* 2018; 4: 8-10
23. Mojka K. Probiotyki, prebiotyki, symbiotyki – charakterystyka i funkcje. *Problemy Higieny i Epidemiologii* 2014; 95(3): 541-549.

24. Czarnecka-Operacz M. Diagnostyka różnicowa atopowego zapalenia skóry. *Dermatologia po Dyplomie* 2016; 3
25. Silny W, Czarnecka-Operacz M. Profilaktyka i leczenie atopowego zapalenia skóry u dzieci, młodzieży i dorosłych.
26. Available at: www.leksykon.com.pl/images/PDF/azs2008.pdf Accessed on 17.03.2020.
27. Bożek A, Dzienniak A, Foks A, et al.: Treatment methods of atopic dermatitis. *Medycyna Rodzinna* 2014; 17(4): 170-6
28. Nowicki R, Trzeciak M, Wilkowska A. et al.: Atopic dermatitis: current treatment guidelines. Statement of the experts of the Dermatological Section, Polish Society of Allergology, and the Allergology Section, Polish Society of Dermatology. *Postępy Dermatologii i Alergologii* 2015; 32(4): 239-249