Understanding Atopic Dermatitis (Eczema)

Atopic Dermatitis (AD)

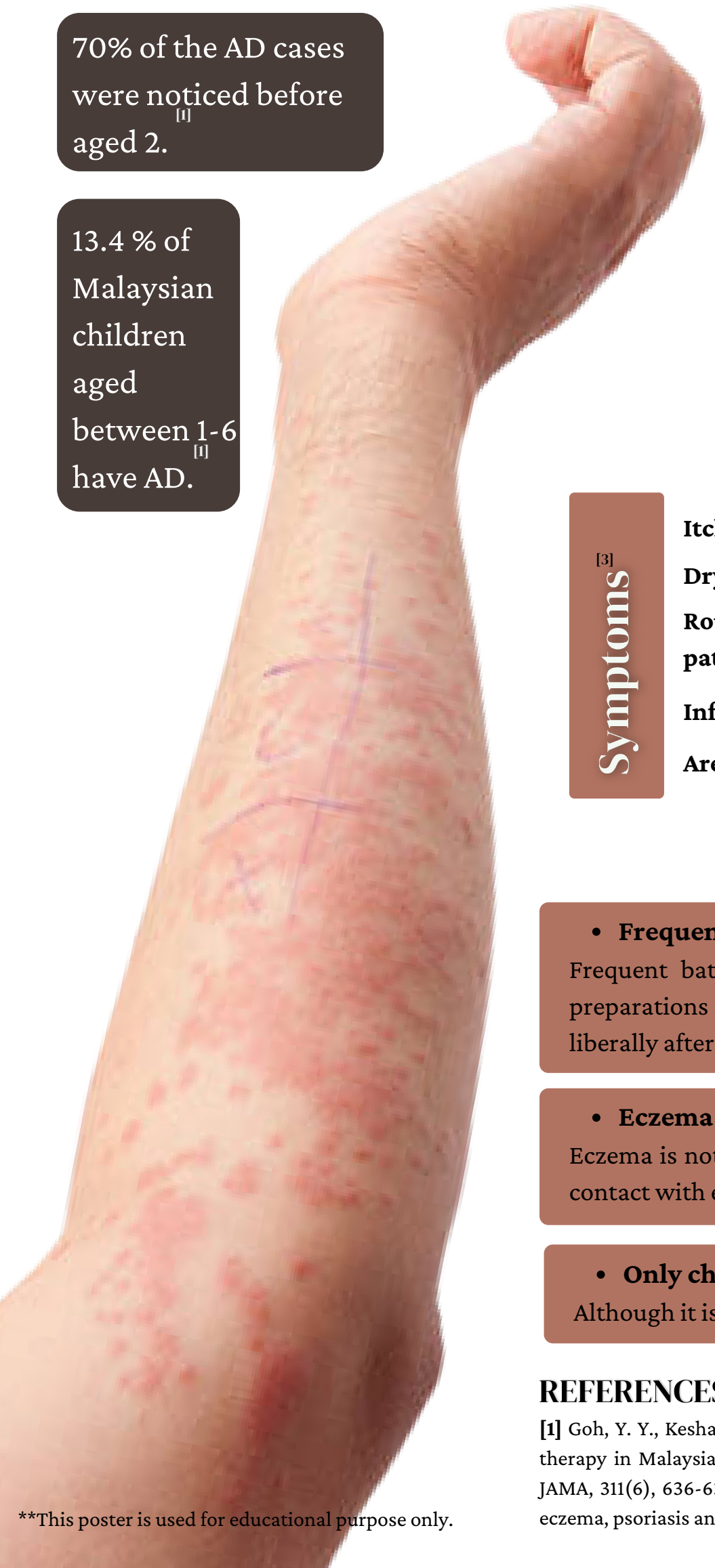
Allergy **The Skin** **Inflammation**

It is the most common type of eczema. Atopic dermatitis usually starts in infancy or childhood but many children outgrow it. Occasionally, adults develop it. AD is a chronic relapsing, noncontagious skin inflammation characterized by dry skin and itch. [2]

A higher prevalence (41.7%) of AD was observed in those where first-degree members had atopic diseases. [1]

70% of the AD cases were noticed before aged 2. [1]

13.4 % of Malaysian children aged between 1-6 have AD. [1]



Causes [2]

Atopic dermatitis is a complex hereditary disease. Several gene loci have been identified and linked to the development of AD, such as the mutation of the filaggrin (FLG) gene changes the skin condition, which subsequently causes a defective skin barrier.

Outbreaks, or flare-ups, are often caused by environmental factors such as certain fabrics, chemicals, perfumes, pets, dust, smoke, foods, or stress.

Symptoms [3]

- **Itch**
- **Dry, sensitive skin**
- **Rough, leathery or scaly patches of skin**
- **Inflamed, discolored skin**
- **Areas of swelling**

Myths about Eczema [3]

- **Frequent bathing of the affected areas is helpful and soothing**

Frequent bathing and long, hot showers should be avoided; moisturizing preparations instead of soaps should be used and moisturizers also applied liberally after bathing should be helpful.

- **Eczema is contagious**

Eczema is not contagious, and one can't acquire the condition by coming into contact with eczema sufferers or their belongings.

- **Only children get eczema**

Although it is common in children, the condition is often seen later in life.

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Current Treatment for Atopic Dermatitis

Impact [1]

Eczema is not dangerous or contagious but it can cause discomfort and distress, including social stress for children and job difficulties for adults.

Discomfort (e.g. itch, pain)

Job Difficulties

Social Stress

Treatment [2] [3]

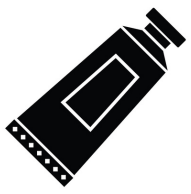
There is no cure for eczema and no single treatment, but you and your doctor can work together to manage it for you or your child. Eczema can be stressful for families because of a child's discomfort and appearance from the rash. The goals of treatment are to prevent flare-ups and, when they happen, to prevent infection. Treatment involves preventing environmental triggers when possible, maintaining appropriate skincare, and using medications.

Moisturizing 1

People with eczema have a damaged skin barrier, which makes their skin more sensitive to irritants and worsens their skin conditions. Moisturizers can help to protect the skin barriers from irritants and retain water.

- Cover damp skin with thick lotion or cream(such as petroleum jelly).
- Avoid soap; use a soap substitute instead.
- Take lukewarm baths or showers.
- Avoid rough, scratchy fabrics such as wool.
- Avoid cold, dry air.

Prescription Topicals 3



Topical medicines, such as topical calcineurin inhibitors (non-steroidal medications) and topical steroids, can suppress the cells' immune functions to stop the eczema symptoms such as redness and itch.

However, patients should follow the doctor's advice because there may be some side effects of using prescribed drugs. For example, patients may have worsened eczema symptoms after they stop using topical steroids, known as topical steroid withdrawal.

Prescription Oral 5

Doctors may prescribe immunosuppressant for moderate or severe eczema. It helps control or suppress the immune system in order to slow down the symptoms of eczema.

Immunosuppressants have the potential for severe side effects, such as increased risks of infections, increased risks of certain cancer, upset stomach and vomiting, etc.

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2 Over the counter

Eczema can cause itch, pain, and inflammation. Over-the-counter (OTC) medications such as **anti-histamines**, which are often used to relieve allergic symptoms, can help to relieve itch and combat inflammation.

OTC steroids also can be used to reduce irritation, itching, and inflammation. OTC steroids come in many forms, including ointments, creams, lotions and gels.

4 Prescription Injectables

Injection of biologics for eczema is applied to stop or limit parts of the immune system related to eczema. A calmer immune system means lower or less severe inflammation and therefore fewer symptoms of atopic dermatitis.

For example, dupilumab is used for patients aged 6 years old and above to relieve moderate or severe AD symptoms. Side effects of dupilumab includes pink eye, injection site reactions, and cold sores on the mouth or lips.

6 Phototherapy

Phototherapy or light therapy is the treatment with patients exposed to different wavelengths of ultraviolet (UV), such as narrowband ultraviolet B (NB-UVB) light, to reduce the inflammatory response in the skin. It improves the eczema symptoms after a few weeks of treatment.

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[1] Sugerman, D. T. (2014). Atopic Eczema. JAMA, 311(6), 636-636. **[2]** National Eczema Association. (n.d.). Eczema Treatments Overview. Retrieved from https://nationaleczema.org/eczema/treatment/, on 12th November, 2021. **[3]** National Eczema Society. (2018). Phototherapy. Retrieved from https://eczema.org/wp-content/uploads/Phototherapy-Oct-18-1.pdf, on 12th November, 2021.

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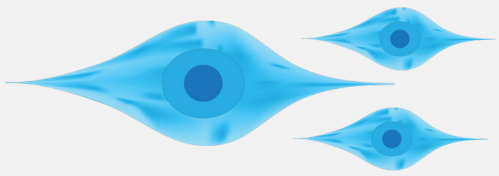
Potential Therapeutic Effects of Mesenchymal Stem Cell Therapy for Atopic Eczema (AD)

Features of Mesenchymal Stem Cells (MSCs)



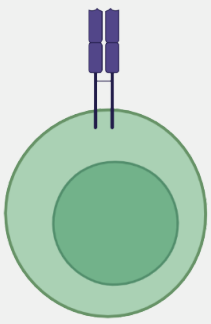
MULTIPOTENT MSCs can differentiate into different specialized cells such as bone cells, muscle cells, neurons, adipose, endothelial cells, etc.

ANTI-INFLAMMATORY EFFECT MSCs have the ability to regulate immune cell function, suppress lymphocyte function to prevent over-inflammatory responses to cause further tissue damage

TISSUE REPAIR AND REGENERATION MSCs can differentiate into different kinds of cells, show protective effect to many tissues and secrete growth factors to the damaged cells through their paracrine action.

MSCs and AD

1 Effect of MSCs on T Cells



Acute AD is mediated by Th2 cells

Cytokine secreted: IL-4, IL-13

Chronic AD is mediated by Th1 cells

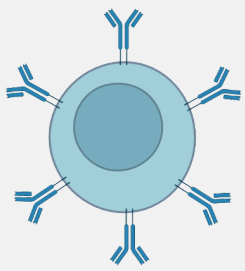
Cytokine secreted: IL-5, IL-12, IFN-γ

In sensitization with allergens, MSCs restores the Th1/Th2 imbalance by reducing Th2 cytokines and elevating IFN-γ levels [3]. These effects possibly reduce or prevent allergen sensitization, resulting in the reduction or prevention of allergen-specific IgE production and allergen-specific Th2 production.

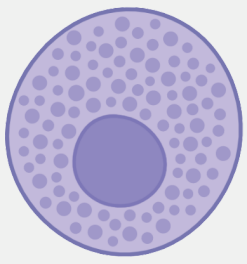
2 Effect of MSCs on B Cells

B cells play a critical role in the immune system and abnormalities in these cells' functions result in a variety of chronic inflammation and autoimmune-mediated disorders, including AD [2].

An intravenous injection of BM-MSCs was shown to suppress AD via inhibition of allergen-specific IgE production by B cells [2]



3 Effect of MSCs on Mast Cells



Mast cells regulate the trafficking and functions of cells involved in the skin inflammatory response through the release of several soluble mediators, including chemokines, cytokines, and growth factors [2].

Allergens bind to allergen-specific IgE to trigger the histamine released from mast cells (mast cell degranulation). Mast cell degranulation and the release of mediators elicit the itching response in AD. Through the release of cytokines and mediators, MCs recruit more immune cells to the site of inflammation [2].

MSCs can efficiently inhibit the infiltration and degranulation of mast cells and consequently inhibit histamine release [2, 3]. A reduced number of mast cells at the site of inflammation prevent itching responses and continuously scratching that may be involved in the acceleration of AD symptoms [1].

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[1] Kim, H. S., Yun, J. W., Shin, T. H., Lee, S. H., Lee, B. C., Yu, K. R., ... & Kang, K. S. (2015). Human Umbilical Cord Blood Mesenchymal Stem Cell-Derived PGE 2 and TGF-β1 Alleviate Atopic Dermatitis by Reducing Mast Cell Degranulation. Stem cells, 33(4), 1254-1266. [2] Daltro, S. R. T., Meira, C. S., Santos, I. P., Ribeiro dos Santos, R., & Soares, M. B. P. (2020). Mesenchymal Stem Cells and Atopic Dermatitis: A Review. Frontiers in Cell and Developmental Biology, 8, 326. [3] Kim, E. Y., Kim, H. S., Hong, K. S., Chung, H. M., Park, S. P., & Noh, G. (2021). Mesenchymal stem/stromal cell therapy in atopic dermatitis and chronic urticaria: immunological and clinical viewpoints. Stem cell research & therapy, 12(1), 1-20.

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