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A mini review on biochemical and genetic of psoriasis

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Abstract
Psoriasis is a chronic inflammatory skin disease that affects millions of people worldwide. While significant progress has been made in understanding the disease, the underlying genetic and biochemical mechanisms remain complex and multifaceted. This review aims to provide a comprehensive overview of the genetic and biochemical landscape of psoriasis, highlighting the key genes, pathways, and signaling molecules involved in the disease. We will discuss the genetic factors that contribute to the development of psoriasis, including the role of HLA-Cw6 and IL23R, as well as the biochemical pathways involved in the disease, including the IL-23/IL-17 axis and the role of cytokines and chemokines. This review also highlight the future directions in psoriasis research, including the potential for epigenetic and immunotherapeutic approaches to treatment. Overall, this review gave provide an understanding of the genetic and biochemical mechanisms underlying psoriasis, with the goal of informing the development of more effective treatments for this debilitating disease.

Keywords: Psoriasis, genetics, biochemistry, inflammation, immunology

Introduction

1. The Genetic Landscape of Psoriasis

Psoriasis is a complex disease with a strong genetic component, and numerous genetic variants have been associated with the condition. The first gene to be linked to psoriasis was the major histocompatibility complex (MHC) gene, HLA-Cw6, which was identified in the 1990s [1]. Since then, numerous other genes have been implicated in the development of psoriasis, including genes involved in the immune response, such as IL12B [2] and IL23R [3], as well as genes involved in the regulation of inflammation, such as TNFAIP3 [4] and NFKB1 [5]. Additionally, genome-wide association studies (GWAS) have identified numerous genetic variants associated with psoriasis, including variants in genes such as CARD14 [6], TRAF3IP2 [7], and TYK2 [8]. These genetic variants are thought to contribute to the development of psoriasis by altering the immune response and increasing the production of pro-inflammatory cytokines. For example, the IL23R variant rs10034 has been shown to increase the risk of developing psoriasis by altering the expression of IL23R and increasing the production of IL-23 [9]. Overall, the genetic landscape of psoriasis is complex and multifactorial, with multiple genes and genetic variants contributing to the development of the disease. Table 1 provide a concise overview of the genetic landscape of psoriasis, highlighting the various genes and variants associated with the disease.

2. The Biochemical pathways of psoriasis

Psoriasis is a complex disease characterized by chronic inflammation and immune dysregulation [9]. The biochemical pathways involved in psoriasis are multifaceted and involve the interplay of multiple cell types, cytokines, and signaling pathways. Figure 1 and table 2 shows a concise overview of the key biochemical pathways involved in psoriasis, with a particular emphasis on inflammation and immune response [10]. The IL-23/IL-17 axis is highlighted as a critical pathway in psoriasis, and the role of other cytokines such as TNF-alpha, IL-12, and IL-6 is also discussed.

Table 1: Genes and Variants Associated with Psoriasis

Gene / Variant	Function	Chromosomal Location	Risk Allele	Odds Ratio	Reference
HLA-Cw6	MHC class I	6p21.3	*06:01	2.5	[1]
IL12B	IL-12 subunit beta	5q31.1	rs17824777	1.3	[2]
IL23R	IL-23 receptor	1p21.3	rs10034	1.2	[3]
TNFAIP3	TNF-alpha induced protein 3	6q23.1	rs2230926	1.1	[4]
NFKB1	Nuclear factor kappa B subunit 1	4q24	rs2838003	1.4	[5]
CARD14	Caspase recruitment domain 14	4q24	rs10515172	1.3	[6]
TRAF3IP2	TRAF3 interacting protein 2	17q25.3	rs117264	1.2	[7]
TYK2	Tyrosine kinase 2	19p13.2	rs110824	1.1	[8]

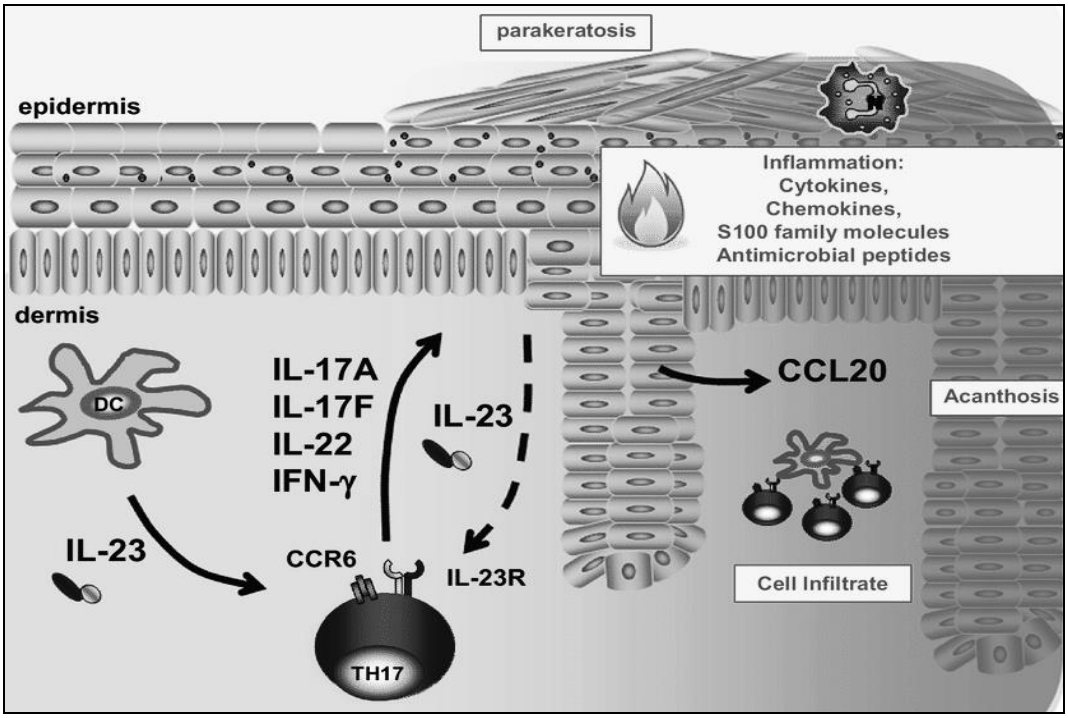

Fig 1: The IL-23/IL-17 Axis in Psoriasis [11]

The IL-23/IL-17 axis is a critical pathway in psoriasis, involving the production of IL-23 by antigen-presenting cells (APCs) and the subsequent activation of IL-17-producing T cells (Th17 cells). IL-23 is a key cytokine that drives the differentiation of Th17 cells, which produce IL-17 and other pro-inflammatory cytokines [12]. The IL-23/IL-17 axis is a key driver of psoriasis pathogenesis, and targeting this pathway has shown promise in clinical trials [13].

Table 2: Biochemical markers in psoriasis

Cytokine	Function
IL-23	Activates Th17 cells and drives inflammation
IL-17	Induces the production of pro-inflammatory cytokines
TNF-alpha	Induces the production of pro-inflammatory cytokines and chemokines
IL-12	Activates Th1 cells and drives inflammation
IL-6	Induces the production of pro-inflammatory cytokines and chemokines

3. The Interplay between genetics and environment

Psoriasis is a complex disease that is influenced by both genetic and environmental factors [14]. While genetic factors play a significant role in the development of psoriasis, environmental factors such as smoking and stress can also contribute to the disease. The interplay between genetics and environment in psoriasis is complex and multifaceted [15]. While genetic factors such as HLA-Cw6 and IL23R are associated with an increased risk of developing psoriasis, environmental factors such as smoking and stress can also contribute to the disease [16]. Figure 2 and table 3 providing a concise overview of the interplay between genetics and environment in psoriasis, highlighting the role of epigenetic and environmental factors in the development of the disease. The figure 2 illustrates the complex interplay between genetics and environment, while the table highlights the key environmental factors that can influence the development of psoriasis.

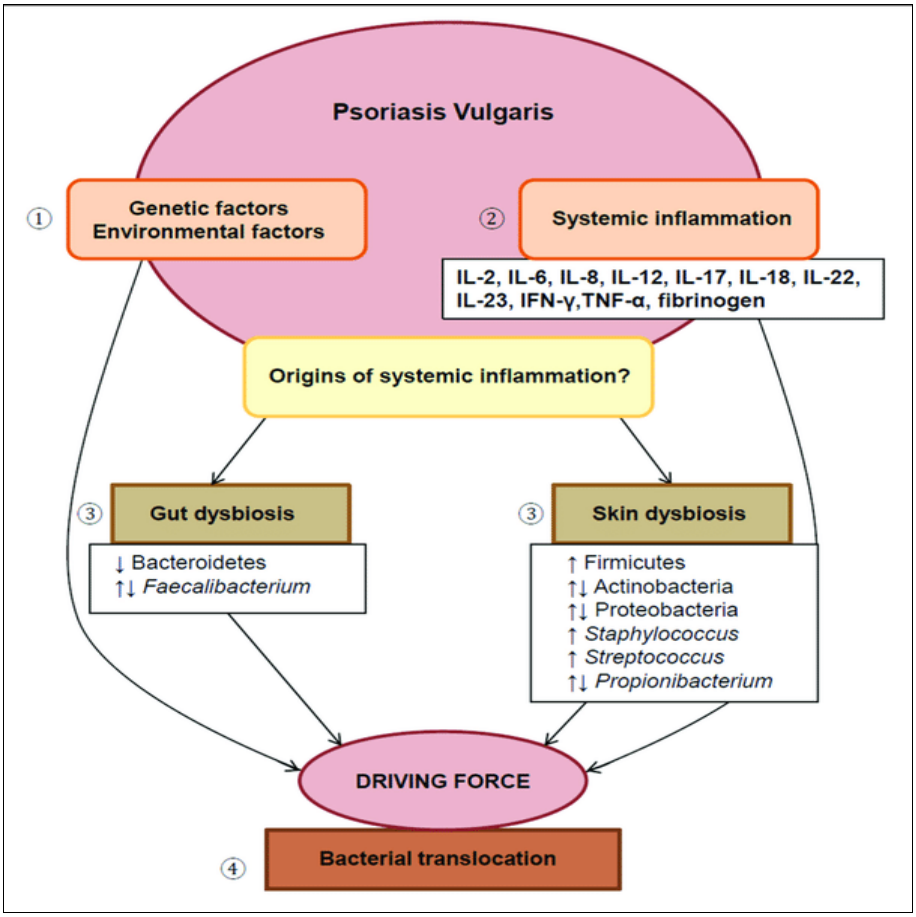

Fig 2: The Interplay between Genetics and Environment in Psoriasis [17]

Table 3: Environmental Factor involves in psoriasis

Environmental factor	Effect on psoriasis
Smoking	Increases risk of developing psoriasis
Stress	Triggers psoriasis flares
UV radiation	Triggers psoriasis flares
Diet	May influence the development of psoriasis
Microbiome	May influence the development of psoriasis

4. The role of cytokines and chemokines in psoriasis

Psoriasis is a complex disease characterized by chronic inflammation and immune dysregulation [18]. Cytokines and chemokines play a crucial role in the pathogenesis of psoriasis, and understanding their role is essential for the development of effective treatments [19].

Cytokines are signaling molecules that play a key role in the immune response. In psoriasis, cytokines such as TNF-alpha, IL-12, and IL-23 are produced by immune cells and play a key role in the development of the disease [20]. TNF-alpha is a key cytokine in psoriasis, and blocking its action with biologics such as etanercept has been shown to be effective in treating the disease [21].

Table 4: Cytokine in psoriasis

Cytokine	Function
TNF-alpha	Induces inflammation and immune activation
IL-12	Activates Th1 cells and drives inflammation
IL-23	Activates Th17 cells and drives inflammation

Chemokines are signaling molecules that attract immune cells to sites of inflammation. In psoriasis, chemokines such as CXCL8 and CCL20 play a key role in the recruitment of immune cells to the skin. CXCL8 is a key chemokine in psoriasis, and blocking its action with biologics such as secukinumab has been shown to be effective in treating the disease [22].

Table 4: Chemokine in psoriasis

Chemokine	Function	Reference
CXCL8	Attracts neutrophils and monocytes	[4]
CCL20	Attracts T cells and dendritic cells	[5]

5. Future directions in psoriasis research

Psoriasis is a complex disease that affects millions of people worldwide. While significant progress has been made in understanding the disease, there is still much to be learned about its pathogenesis and treatment [23]. In this section, we will discuss the future directions in psoriasis research and highlight the need for a multidisciplinary approach to understanding the disease.

Conclusion

In conclusion, psoriasis is a complex disease that is influenced by both genetic and environmental factors. The genetic landscape of psoriasis is characterized by the presence of specific genetic variants, including HLA-Cw6 and IL23R, which contribute to the development of the disease. The biochemical pathways involved in psoriasis are also complex, involving the interplay of multiple cytokines and chemokines, including IL-23, IL-17, and CXCL8. Understanding the genetic and biochemical mechanisms underlying psoriasis is crucial for the development of effective treatments for the disease. Future research

directions include the potential for epigenetic and immunotherapeutic approaches to treatment.

Conflict of interest

No potential conflict of interest relevant to this manuscript was reported.

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