

## Serum Interleukin 17 in Patients with Pattern Hair Loss

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### Abstract

**Objectives:** Evaluation of serum interleukin-17 in female-pattern baldness. **Background:** The top and frontal regions of the scalp are the most vulnerable to pattern baldness. Although interleukin-17 has many important biological roles, those associated with inflammation are the most well studied. **Data sources:** By searching and reviewing Medline databases (Pub Med and Medscape) and the role of serum interleukin 17 level in pattern hair loss available till 2023. **Study selection:** The quality of each study was evaluated separately before inclusion. The following requirements were met for inclusion: Publications in English that examine the significance of serum interleukin 17 level in the aetiology of pattern hair loss from a peer-reviewed publication. **Data extraction:** Studies were not included if they did not meet the inclusion criteria. The quality of a study may be determined by checking its ethical approval, eligibility criteria, controls, information, and evaluation methods. Information relevant to our interested research outcomes was independently retrieved from each qualifying study utilising a data collecting form. **Conclusion:** It's reasonable to say that IL-17 is involved in the aetiology of balding patterns.

**Key Words:** androgen, alopecia, interleukin 17, and pattern hair loss

### 1. Introduction

Androgenetic alopecia (AGA) is a common hair loss condition that affects both sexes, often beginning in the early 20s, and eventually becoming a severe emotional burden for people who suffer from it. AGA is significantly influenced by genetics and hormones (1).

There are six members of the interleukin-17 family (IL-17A–IL-17F). The functions of IL-17A (also known as IL-17) and IL-17F in immune regulation have been investigated extensively, and they are the most homologous of the IL-17 family (2).

Alopecia areata (AA) patients have been shown to have substantially increased blood IL-17A levels, suggesting a potential involvement of IL-17A as a proinflammatory cytokine in the pathogenesis of AA and that IL-17A level may be impacted by age and disease recurrence in individuals with AA (3).

**Lattanand and Johnson (4)** a term used to describe the presence of an inflammatory infiltration of mononuclear cells and lymphocytes in around 50% of the examined scalp samples. Another study by **Jaworsky et al. (5)** hair follicles in the alopecia areata's top third were shown to have an inflammatory infiltration of activated T cells and macrophages. Degranulation of follicular adventitial mast cells and fibrosis of the surrounding perifollicular sheath were also seen.

The purpose of this study was to evaluate the involvement of serum IL-17 in the development and severity of pattern hair loss.

### 2. Materials and methods

**Data Sources:** By searching and reviewing Medline databases (Pub Med and Medscape) and the role of serum interleukin 17 level in the pathogenesis of pattern hair loss available till 2023.

**Study Selection:** All studies were independently assessed for inclusion. They were included if they fulfilled the following criteria: Published in English language, Published in peer-reviewed journals, discuss the role of serum bilirubin and UA levels in the pathogenesis of acne.

**Data Extraction:** Studies were not included if they did not meet the inclusion criteria. The quality of a study may be determined by checking its ethical approval, eligibility criteria, controls, information, and evaluation methods. Information relevant to our interested research outcomes was independently retrieved from each qualifying study utilising a data collecting form.

### 3. Review of literature

#### Pattern hair loss

Androgenetic alopecia (AGA), also known as pattern hair loss (PHL), is a hereditary condition that causes thinning hair in a predictable pattern by gradually shrinking hair follicles and reducing the length of the anagen phase. This results in the gradual transformation of terminal hairs into vellus hairs. Social, psychological, and general quality of life are all negatively affected by AGA, which may begin at any time after puberty (6).

#### Pathogenesis of PHL

The histological characteristic of AGA is the decrease of follicular size. The clinical onset of baldness is preceded by years of gradual hair thinning and, in some cases, accelerated hair loss. This is due to the fact that in AGA, follicular miniaturisation does not strike each individual follicle within a follicular unit at the same time (FU). Miniaturization of follicles occurs in a hierarchical fashion within FUs, with secondary follicles being impacted first and main follicles being affected last (7).

(8) developed a novel theory to explain AGA. The arrector pili muscle (APM) maintains its connection to the primary follicle even as it gradually loses its connection to the secondary follicles in certain FUs during the first phases of hair loss. All of the FUs have undergone the same process of miniaturisation and APM separation seen in the secondary follicles. Without complete baldness, patients may now report thinning hair and a diminishing ponytail. Miniaturization progresses to the point that the muscle in miniaturised FUs entirely detaches from the secondary follicles. Miniaturization of primary follicles is a leading cause of baldness. It's impossible to regrow hair after main follicles have lost their muscular connection. This model should make it easier to comprehend the physiology of hair development and the changes that occur in hair loss.

#### **Clinical features of PHL**

Traditional male pattern baldness manifests as first at the vertex (calvarium) and temples. As it advances, only the outermost layer of hair on the head's sides and back remains. This is known as a "Hippocratic wreath," because it usually stops short of total baldness. Hair loss that does not result in scarring is known as pattern hair loss (9).

The most frequent reason men lose their hair is because of male-pattern baldness. It stands out because of the characteristic progressive pattern of hair loss on the scalp. Bitemporal recession often manifests first in males who have a hereditary predisposition. Next, they experience diffuse frontal loss, followed by a bald spot at the top of their head. The hair on one's crown inevitably falls off. Androgens have a role in the pathogenesis by causing terminal hairs to shrink and transform into vellus hairs. Miniaturization of hair follicles and the ensuing thinning of hair is widely acknowledged as a physiological secondary sexual trait shared by both sexes. When hair loss from androgenetic alopecia is extreme, untimely, and upsetting to the patient, it becomes a medical issue. Androgenic

alopecia in men has been rated on the Hamilton-Norwood scale (10).

Due to the lack of clarity around the connection between androgens and this phenomenon, the name "female pattern hair loss" (FPHL) has replaced "androgenetic alopecia" (AGA) among women. Women suffering from female pattern hair loss are not alone. Often beginning in adolescence, the condition causes a gradual thinning of hair that follows a specific pattern. The increasing shrinkage of hair follicles and consequent loss in the quantity of hairs, most noticeably in the central, frontal, and parietal scalp areas, define FPHL (11).

Similar to its male cousin, female androgenic alopecia seldom results in complete baldness but instead develops widespread thinning without hairline recession. Female-pattern baldness may be quantified on the Ludwig scale. Baldness in women may be classified into Grades 1, 2, and 3 depending on how much of the scalp is visible at the crown (12).

#### **Interleukin 17**

There are six members of the interleukin-17 family (IL-17A–IL-17F). When it comes to immune regulation, IL-17A (also known as IL-17) and IL-17F are the most similar to one another and have been researched the most extensively. The Th17 fraction of CD4+ helper T cells produces the cytokines and signals via the IL-17RA and IL-17RC heterodimeric receptors, which are widely expressed on fibroblasts and epithelial cells of tissues (2).

#### **Structure**

IL-17(A) is a secreted glycoprotein having a molecular mass of 35 kDa and a protein sequence of 155 amino acids. The homodimer consists of two subunits that are each about 15-20 kDa in size. Structure-wise, IL-17 has a 23-amino-acid (aa) signal peptide followed by a family-specific 123-aa chain region. After the protein was purified, two bands at 15 and 20 kDa were observed, indicating the presence of an N-linked glycosylation site. Four conserved cysteines that make up two disulfide linkages were discovered after comparing various members of the IL-17 family. There is no other interleukin that is even somewhat similar to IL-17. Moreover, IL-17 is not related to any other proteins or structural domains that are currently understood (13).

#### **Interleukin 17 receptor signaling**

The SEFIR domain is a cytoplasmic motif shared by all five members of the IL-17 receptor family (IL-17RA, IL-17RB, IL-17RC, IL-17RD, and IL-17RE). Both the homodimer and the heterodimer of IL-17 are able to signal through the dimeric IL-17RA and IL-17RC

receptor complex. When IL-17 binds to its receptor, many signalling pathways are activated via the cytosolic adaptor protein Act1 and other TRAF proteins (14).

Although IL-17R expression is widespread, non-hematopoietic cells are the primary IL-17 targets. Matrix metalloproteinases (MMP1, MMP3, MMP9, and MMP13), anti-microbial peptides (b-defensins, S-100 proteins), and chemokines (CXCL1, CXCL2, CXCL5, CXCL2, CXCL7, CCL20, and IL-8) are all produced in response to IL-17 signalling (15).

#### Role of interleukin 17 in hair follicle

Psoriasis, ankylosing spondylitis, rheumatoid arthritis, and psoriatic arthritis are only a few of the inflammatory illnesses where the effectiveness of IL-17 inhibitors has been established. These encouraging findings suggest that blocking IL-17 may be useful in treating a variety of inflammatory skin conditions. IL-17 is overexpressed in a wide variety of skin illnesses, including infections, inflammations, neutrophilic disorders, granulomatous conditions, bullous disorders, and even cancers of the skin (16).

Alopecia areata (AA) is characterised by elevated blood IL-17 levels that correlate with disease severity. Patients with a single area of baldness have lower concentrations than those with alopecia universalis/totalis, for example. Hair follicles are surrounded by a lymphocytic infiltration, where the IL-17+ cells may be found. The IL-17 and IL-21 receptor genes have been related to AA by a genome-wide association analysis (17).

Serum IL-17A levels are considerably higher in AA patients, which may indicate a function for IL-17A as a proinflammatory cytokine in the pathogenesis of AA and that IL-17A levels may be affected by age and disease recurrence in AA patients (3).

#### 4. Conclusion

Based on the findings of this study, we conclude that IL-17 has a role in the pathophysiology of pattern hair loss. Moreover, IL-17 has therapeutic potential for a range of autoimmune and immunoinflammatory conditions. After numerous biologic medicines were shown to be generally well tolerated, it was proposed to therapeutically target the IL-17 pathway in AGA.

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