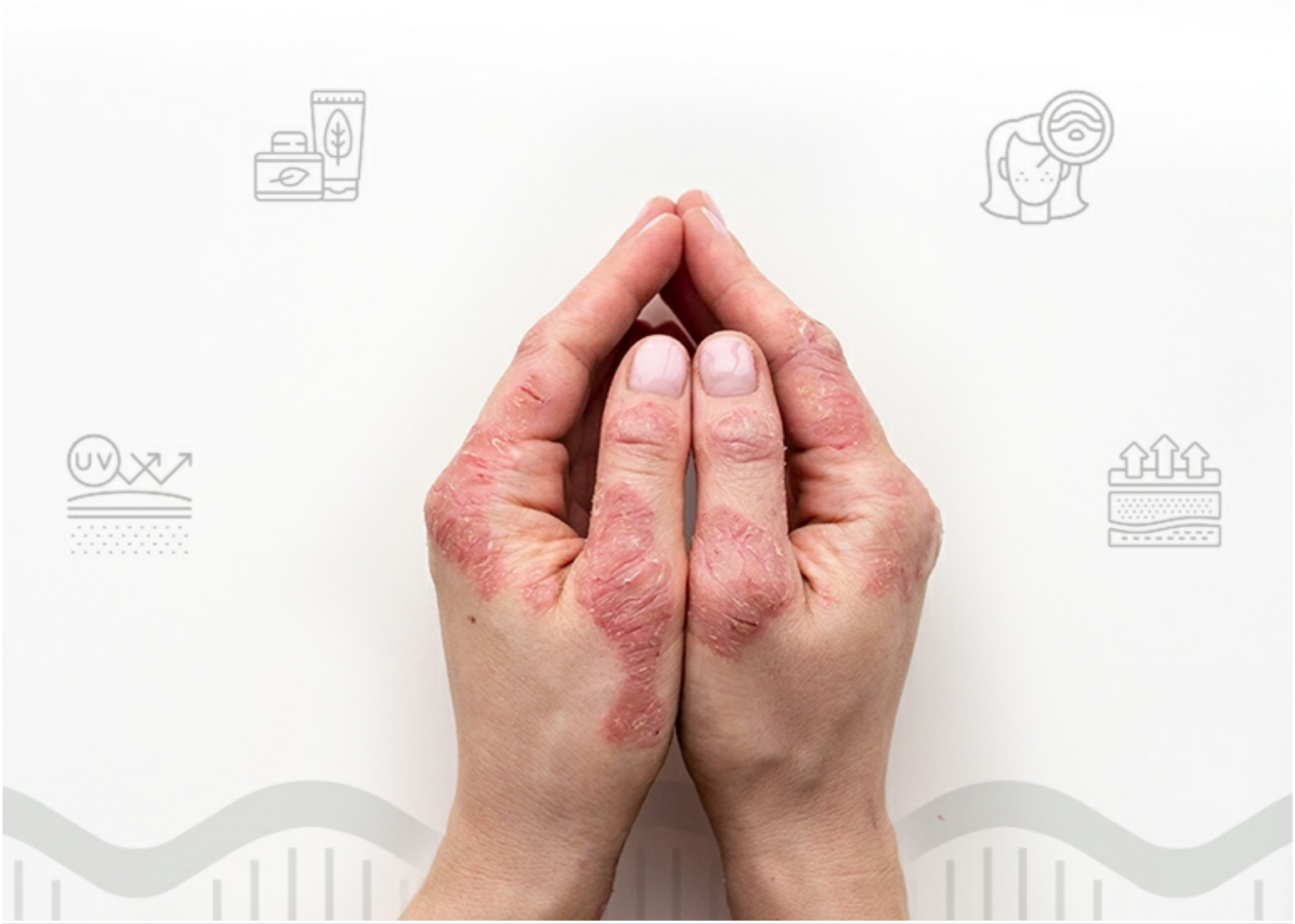
DERMATOLOGY GENOMICS



Category Summary

MORPHOLOGY AND TEXTURE

Hair Colour

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Alopecia

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Acne

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Striae Distensae

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Skin Colour

Hair Colour

What is Hair Colour ?

Hair morphology, just like skin color, is one of the most varied genetic traits among human populations. The amount of melanin pigmentation expressed by hair follicles determines hair color. Melanin pigment is of two types, eumelanin and pheomelanin. Higher proportion of eumelanin determines darker hair color and lower proportion determines lighter hair color. There are two types of eumelanin, brown and black, which lead to brown and black colored hair, correspondingly. Pheomelanin is responsible for red colored (ginger) hair.

Interpretation

As per your genotype, you have a slightly high probability of having blonde hair and low probability of having dark hair.

Gene Table

Gene Name: TPCN2 | Your Genotype: AA

Two pore segment channel 2 (TPC2) is a human protein encoded by the TPCN2 is a protein which in humans is encoded by the TPCN2 gene. TPC2 polymorphisms are associated with a hair pigmentation.

Gene Name: Near SLC24A4 | Your Genotype: GT

This gene encodes a member of the potassium-dependent sodium/calcium exchanger protein family. Alternative splicing results in multiple transcript variants.This gene suggests a role for the SLC24A4 gene in variations in hair and eye pigmentation.

Gene Name: HERC2 | Your Genotype: TT

Genetic variations in this gene are associated with skin/hair/eye pigmentation variability. Multiple pseudogenes of this gene are located on chromosomes 15 and 16.

Gene Name: SLC24A5 | Your Genotype: AA

SLC24A5 gene encodes a member of the potassium-dependent sodium/calcium exchanger protein family. SLC24A5 is a cation exchanger involved in pigmentation, possibly by participating in ion transport in melanosomes. Predominant sodium-Calcium exchanger in melanocytes. Probably transports 1 Ca2+ and 1 K+ to the melanosome in exchange for 4 cytoplasmic Na+. Alternative splicing results in multiple transcript variants

Gene Name: SLC45A2 | Your Genotype: TT

The SLC45A2 gene (also called MATP) provides instructions for making a protein that is located in specialized cells called melanocytes. These cells produce a pigment called melanin, which is the substance that gives skin, hair, and eyes their color. Melanin is also found in the light-sensitive tissue at the back of the eye (the retina), where it plays a role in normal vision.

Gene Name: IRF4 | Your Genotype: CT

IRF4 gene, encoding a member of a helix-loophelix family of DNA-binding transcription factors involved in downstream regulation of interferon signaling. IRFs are primarily associated with immune system development and response. IRF4 is predominantly expressed in lymphocytes, macrophages, B-cells and dendritic cells, but also in melanocytic lineages. The IRFs are important in the regulation of interferons in response to infection by virus, and in the regulation of interferon-inducible genes. This family member is lymphocyte specific and negatively regulates Toll-like-receptor (TLR) signaling that is central to the activation of innate and adaptive immune systems.

Gene Name: Near TYRP1 | Your Genotype: TT

The TYRP1 gene provides instructions for making an enzyme called tyrosinase-related protein 1. This enzyme is located in melanocytes, which are specialized cells that produce a pigment called melanin.

Alopecia

What is Alopecia ?

Alopecia is a skin condition characterized by sudden hair loss. The two types of alopecia are Alopecia areata (AA) and Androgenic alopecia (AGA). AA is a T cell dependent autoimmune hair loss disease that is specific to the skin. AGA is characterized by thinning of hair and a receding hairline. It is believed to be caused by increased activity of androgen receptors in hair follicles, but it is unclear how it leads to hairloss. However, its affiliation with disorders associated with increased androgen levels such as coronary heart disease and prostate cancer in men and polycystic ovary syndrome (PCOS) in women as a potential cause.

8.0

Alopecia

Interpretation

As per your genotype, you have a slightly elevated risk of developing alopecia. Other factors such as stress, autoimmune disorders, certain infections, vaccinations, certain drugs, and hormonal fluctuations can increase the risk of developing of alopecia areata; factors such as age, family history, diet, and environmental factors such as pollution (over-accumulation of certain heavy metals in the scalp, resulting in hair loss) can increase the risk of developing androgenic alopecia.

Gene Table

Gene Name: Near TARDBP | Your Genotype: AA

Transactivator Tat dependent on an RNA regulatory element (TAR) located downstream of the transcription initiation site, is a transcriptional repressor that binds to chromosomally integrated TAR DNA and represses HIV-1 transcription

Gene Name: IMP5 | Your Genotype: TT

Signal peptide peptidase like 2C (SPPL2C) also known as IMP5. SPPL2C has not been characterized, and the lack of introns, low level of expression and high degree of polymorphism in the human gene has led to the suggestion that it is a pseudogene

Gene Name: WNT10A | Your Genotype: CT

Long-term absence of WNT10A leads to miniaturization of hair follicle structures and enlargement of the associated sebaceous glands, a phenomenon that is also observed in male pattern baldness. Together with a previously published genome-wide association study, lower levels of WNT10A may contribute to male pattern baldness in some individuals.

Gene Name: Near HDAC4 | Your Genotype: CC

By interaction with transcription factors ARR19 and CRIF1, HDAC4 plays a critical role in inhibition of AR transactivation and its accumulation coincides with loss of androgen sensitivity in prostate cancer, a shared etiologic factor with AGA

Gene Name: Near LINC01432 | Your Genotype: TT

The chromosome 20p11 locus has a strong effect on the development of early-onset AGA, with no obvious genetic connection to the androgen pathway. Discovering the functional consequences will increase our understanding of the molecular and cellular basis of scalp hair loss.

Gene Name: Near LOC100270679 | Your Genotype: TT

Long intergenic non-protein coding RNA 1434

Gene Name: Near PAX1 | Your Genotype: TT

PAX1 was found to be expressed at very low levels in femoral skin and hair, but showed considerable expression in scalp skin. This gene is a member of the paired box (PAX) family of transcription factors. Members of the PAX family typically contain a paired box domain and a paired-type homeodomain.

Gene Name: LINC01432 | Your Genotype: TT

Long intergenic non-protein coding RNA 1432

Gene Name: ICOSLG | Your Genotype: CC

Upon activation, Treg expresses the inducible co-stimulator (ICOS), a receptor that modulates the function of Treg. ICOS binds to a unique ligand, ICOS ligand (ICOSLG). In mouse models of autoimmunity, Treg expressing ICOS were shown to produce IL-10 and to control autoreactive T cells in the invaded organ. ICOSLG polymorphisms could be associated with Alopecia Areata development.

Gene Name: EDAR2 | Your Genotype: AA

Ectodysplasin A2 receptor encoded by EDA2R gene is a type III transmembrane protein of the TNFR (tumor necrosis factor receptor) superfamily, and contains cysteine-rich repeats and a single transmembrane domain. This protein binds to the EDA-A2 isoform of ectodysplasin, which plays an important role in maintenance of hair and teeth

Gene Name: Near AR | Your Genotype: AA

The AR gene provides instructions for making a protein called an androgen receptor. Androgens are hormones (such as testosterone) that are important for normal male sexual development before birth and during puberty. Androgen receptors allow the body to respond appropriately to these hormones. The receptors are present in many of the body's tissues, where they attach (bind) to androgens. The resulting androgen-receptor complex then binds to DNA and regulates the activity of androgen-responsive genes. By turning the genes on or off as necessary, the androgen receptor helps direct the development of male sexual characteristics. Androgens and androgen receptors also have other important functions in both males and females, such as regulating hair growth and sex drive. Androgen Receptor gene allows receptor for androgen to carry normal male sexual development functions

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Gene Name: FOXP3 | Your Genotype: AA

The protein encoded by this gene is a member of the forkhead/winged-helix family of transcriptional regulators. Defects in this gene are the cause of immunodeficiency polyendocrinopathy, enteropathy, X-linked syndrome (IPEX), also known as X-linked autoimmunity-immunodeficiency syndrome. Regulatory T lymphocytes (Treg) are involved in the control of immune homeostasis by preventing autoimmune diseases. Treg are commonly identified by the intracellular expression of forkhead box P3 transcription factor (FOXP3) that controls their development and function. FOXP3 and ICOSL polymorphisms, modulating the activity of these immune-related genes, may predispose to Alopecia Areata by decreasing FOXP3 and ICOSLG expression at mRNA level.

Gene Name: HDAC9 | Your Genotype: GT

This gene codes for Histone deacetylase 9. HDAC9 might influence pathogenesis of Androgenetic alopecia through dysregulation of the androgen pathway, highlighting a shared etiologic factor in this condition and prostate cancer.

Do's and Don'ts

Do's

- Maintain a healthy and nutrient rich diet of lean proteins, fruits, and vegetables, whole grains, legumes, fatty fish like salmon and low-fat dairy for healthy hair.
- Protect exposed scalp from sunburns by using sunscreens or hats.
- Consult a doctor/therapist in case of stress, anxiety, and depression.
- If eye lashes are lost, wear a pair of glasses to protect eyes from airborne pollutants and dust particles.

Don'ts

- Try to avoid emotional or physical stress.
- Avoid smoking.

Acne

What is Acne ?

Acne, or acne vulgaris, is one of the most common dermatological conditions. It is a chronic inflammatory disease of the pilosebaceous unit (comprising the hair follicle, hair shaft, and sebaceous gland). It is characterised by comedones, papules, pustules, nodules, cysts, and/or scarring, primarily on the face and trunk. Hormonal changes lead to increased production of sebum and causes acne of varying severity.

6.6

Acne

Interpretation

As per your genotype, you have a slightly elevated risk of developing acne. Other factors such as stress, diet, hormonal changes, menstruation, changes in dietary fat or carbohydrate intake, higher Body Mass Index (BMI), and medications containing androgens, and medical conditions such as Polycystic Ovarian Syndrome (PCOS) can increase the risk of developing acne.

Gene Table

Gene Name: Near SELL | Your Genotype: GA

This gene encodes a cell surface adhesion molecule (selectins) that belongs to a family of adhesion/homing receptors.These selectins of adhesion molecules have important roles in regulating homoeostasis and cutaneous inflammation. L-selectin is expressed on the surface of most circulating leukocytes, facilitating leukocyte migration into secondary lymphoid organs and inflammation sites. P- and E-selectin, expressed on inflamed endothelium, are likewise responsible for the accumulation of blood leukocytes at sites of inflammation by mediating the adhesion of cells to the vascular lining. Analysis of the gene expression profiles revealed that the mRNA expression of SELL was upregulated in acne lesions. L-selectin has been shown to have an important role in mediating cutaneous inflammation by studies using gene-targeted mice. Another study also reported a highly significant negative correlation between soluble L-selectin and the inflammatory disorder diffuse systemic sclerosis (dSSc). Similarly, in mice lacking both L-selectin and intercellular adhesion molecular-1 (ICAM-1) expression, the healing of wounds is delayed, probably due to the decreased leukocyte accumulation into the wound site. Similarly, the absence of both P- and E-selectins markedly reduced recruitment of inflammatory cells and impaired closure of the wounds. Taken together, these findings implicate a potential pathogenic role of selectins in inflammation and the scar-forming processes associated with severe acne.

Gene Name: Near TGFB2 | Your Genotype: AA

This gene encodes a secreted ligand of the TGF-beta (transforming growth factor-beta) superfamily of proteins. The biology of TGFb is consistent with a role in acne pathogenesis. Keratinocyte hyperproliferation, which may lead to follicular obstruction and comedo formation in acne is inhibited by TGFb. Likewise, TGFb decreases sebaceous gland lipid production which is increased and altered in acne. Finally, innate immune responses, elicited during microbial colonization by P. acnes may be modulated by TGFb.

Gene Name: Near OVOL1 | Your Genotype: GG

OVOL1 is expressed in human and murine skin, in both hair follicles and interfollicular epidermis. It encodes a zinc-finger transcription factor that is a downstream target of TGF-beta/BMP7–Smad4 signalling, a pathway known to regulate growth of keratinocytes. TGF-beta results in growth arrest of wild-type keratinocytes. A putative role of OVOL1 in skin pathology is not limited to acne since an association signal at this locus has also been reported in atopic dermatitis.

Gene Name: Near DDB2 | Your Genotype: GG

DDB2 encodes a DNA-binding protein that is the smaller subunit of a heterodimeric protein complex and participates in nucleotide excision repair. DDB2 is critical in deciding cell fate (apoptosis or arrest) upon DNA damage and mediates the ubiquitination of the histones H3 and H4, of which H4 has been shown to be a major component in the antimicrobial action of human sebocytes. DDB2 has also been identified as a novel androgen receptor-interacting protein, mediating contact with AR and the CUL4A–DDB1 complex for androgen receptor (AR) ubiquitination/degradation. Consequently, speculating that DDB2 is a biological candidate gene for severe acne is not unreasonable, particularly given its involvement in androgen metabolism and inflammation processes.

Gene Name: IL8 | Your Genotype: AA

Genetic variations in the genes encoding the inflammatory cytokines might confer susceptibility to Diabetic nephropathy by altering their functions or expressions.

Gene Name: Near FST | Your Genotype: AG

Follistatin is a single-chain gonadal protein that specifically inhibits follicle-stimulating hormone release. FST gene encodes soluble protein product follistatin that binds to and neutralizes members of the TGFbeta superfamily, including activin, which is involved in scar formation in skin. Mice overexpressing follistatin display reduced wound healing, whereas overexpression of activin results in epidermal thickening and dermal fibrosis in normal skin and enhanced granulation tissue formation after wounding.

Gene Name: Near TNF | Your Genotype: GG

Gene Name: TNF | Your Genotype: GA

Proinflammatory cytokines such as interleukin (IL)-1, IL-8 and tumour necrosis factor (TNF) contribute to the pathogenesis of acne. TNF has a pivotal role in inflammatory reactions and is a key regulator of the innate immune system. The inflammatory response to TNF is mediated directly and through upregulation of other cytokines. These factors may influence the pathophysiology of acne, and factors affecting TNF production may manipulate the extent of the inflammatory response, which may be useful as prognostic markers for determining the clinical severity of the disease. This gene encodes a multifunctional proinflammatory cytokine that belongs to the tumor necrosis factor (TNF) superfamily. This cytokine is mainly secreted by macrophages. This cytokine is involved in the regulation of a wide spectrum of biological processes including cell proliferation, differentiation, apoptosis, lipid metabolism, and coagulation. This cytokine has been implicated in a variety of diseases, including autoimmune diseases, insulin resistance, and cancer.

Gene Name: Near MYC | Your Genotype: AG

The closest gene around the chromosome 8q24 region is MYC, which has been known as a proto-oncogene and is a particularly compelling candidate in this region. Of interest, Myc has also been reported to regulate the androgenic effect. A Myc consensus site was identified in the androgen receptor (AR) gene to up-regulate AR. Previous studies also reported that Myc enhanced AR expression in androgen-independent prostate cancers and plays a key role in the control of hormone responsiveness and cell proliferation in epithelial prostatic cells. Besides, among the widespread microRNAs repressed by Myc, miR-let-7 was recently found to play an important role in the regulation of androgen signaling by down-regulating AR expression. It is known that higher levels of circulating androgens can lead to the hyperplasia of the sebaceous glands and the seborrhea characterized by acne, and a growing body of evidence has suggested that high levels of circulating androgens are associated with increased risk of breast cancer. Besides, prostate cancer, a well-recognized androgen-related cancer, has been positively associated with a history of severe acne in epidemiologic study. Thus, the regulation of androgen by Myc may be a common mechanism underlying the association between acne and certain cancers.

Do's and Don'ts

Do's

- It is recommended to apply water-resistant sunscreen with SPF 30 or greater and broad-spectrum protection against UVA and UVB rays, at least 15-30 minutes before sun exposure. Consult your dermatologist to choose the most suitable sunscreen.
- Use broad-brimmed hats, protective clothing, and good quality sunglasses to avoid skin damage from sun exposure.
- Consult a dermatologist to get appropriate intervention in case of any skin problems.
- Eat a healthy diet and follow a suitable exercise regimen to maintain a healthy BMI, in order to reduce the risk of developing acne.
- Drink plenty of water to stay hydrated.
- Consuming foods like yellow and orange fruits and vegetables such as carrots, apricots and sweet potatoes, spinach and other dark green and leafy vegetables, tomatoes, blueberries, whole-wheat bread, brown rice, quinoa, pumpkin seeds, beans, peas, lentils, omega-3 fatty acid rich foods such as salmon, mackerel and other kinds of fatty fish, and nuts can help in reducing skin inflammation.
- If you have particularly bad or cystic acne, consult your dermatologist.

Don'ts

- Avoid using too many products or over cleansing your face since it may increase irritation and inflammation.
- Avoid using moisturizers or cosmetic products that are very greasy.
- If you have acne, avoid picking on or squeezing the lesions, as that can cause unsightly scars.

Striae Distensae

What is Striae Distensae ?

Striae distensae, commonly known as stretch marks, are a form of scarring on the skin with erythematous (red), violaceous, or hypopigmented linear striations (means a series of ridges, furrows, or linear marks) occuring due to stretching of the dermis (the inner layer of skin) when skin changes shape rapidly due to growth or weight gain. There are two main types of striae distensae, striae rubra and striae alba. Striae rubra are acute presentation of striae distensae and are characterized by an erythematous (red) to violaceous color. Over time, striae rubra evolve into striae alba, which appear hypopigmented, atrophic, and scar-like.

6.9

Striae Distensae

Interpretation

As per your genotype, you have a slightly elevated risk of developing striae distensae. Other risk factors like rapid change in body shape due to growth, weight gain, and pregnancy can increase your risk of developing striae distensae.

Gene Table

Gene Name: HMCN1 | Your Genotype: GC

HMCN1 codes for Hemicentin 1. This gene encodes a large extracellular member of the immunoglobulin superfamily. Mutations in this gene may be associated with age-related macular degeneration.

Gene Name: Near NPIPL2 | Your Genotype: GA

Nuclear pore complex interacting protein family member B15 is encoded by the gene NPIPL2

Gene Name: Near FN1 | Your Genotype: GA

This gene encodes fibronectin, a glycoprotein present in a soluble dimeric form in plasma, and in a dimeric or multimeric form at the cell surface and in extracellular matrix. The encoded preproprotein is proteolytically processed to generate the mature protein. Fibronectin is involved in cell adhesion and migration processes including embryogenesis, wound healing, blood coagulation, host defense, and metastasis.

Gene Name: Near PNPLA1 | Your Genotype: CC

The protein encoded by this gene belongs to the patatin-like phospholipase (PNPLA) family, which is characterized by the presence of a highly conserved patatin domain. PNPLA family members have diverse lipolytic and acyltransferase activities, and are key elements in lipid metabolism. While other members of this family have been well characterized, the function of this gene remained an enigma. However, recent studies show that this gene is expressed in the skin epidermal keratinocytes, and has a role in glycerophospholipid metabolism in the cutaneous barrier. Consistent with these observations, mutations in this gene are associated with ichthyosis in human (autosomal recessive congenital ichthyoses, ARCI).

Gene Name: Near ELN | Your Genotype: CC

ELN gene codes for Elastin. Elastin is the major component of elastic fibers, which provide reversible extensibility to connective tissue. Mutations in elastin that result in a loss of mature elastin can lead to autosomal dominant cutis laxa (a condition characterized by loose, sagging skin, and higher risks of aortic aneurysm) or supravalvular aortic stenosis (a localized narrowing of the ascending aorta caused by thickening of the aortic smooth muscle layer to compensate for the loss of elastin). ELN is also one of the genes deleted in Williams–Beuren syndrome, whose symptoms can include lax skin and supravalvular aortic stenosis, among others. This gene encodes a protein that is one of the two components of elastic fibers. Elastic fibers comprise part of the extracellular matrix and confer elasticity to organs and tissues including the heart, skin, lungs, ligaments, and blood vessels. The encoded protein is rich in hydrophobic amino acids such as glycine and proline, which form mobile hydrophobic regions bounded by crosslinks between lysine residues. Degradation products of the encoded protein, known as elastin-derived peptides or elastokines, bind the elastin receptor complex and other receptors and stimulate migration and proliferation of monocytes and skin fibroblasts. Elastokines can also contribute to cancer progression. Deletions and mutations in this gene are associated with supravalvular aortic stenosis (SVAS) and autosomal dominant cutis laxa.

Do's and Don'ts

Do's

- Maintaining a healthy weight along with following a balanced diet and adequate hydration is essential.
- Consult a doctor before getting chemical treatments, laser treatments, and procedures involving exposure to UV light.
- Massaging with silicone gels and other topical applications of almond, coconut, chamomile oil, cocoa butter, etc. is known to reduce the severity of stretch marks.

Don'ts

- Avoid light and laser therapies if you have a darker skin type.

Eye Colour

What is Eye Colour ?

Eye color or pigmentation is the color of the iris, which is based on the levels of melanin (the natural pigment in our bodies). The eye color varies from blue, green, light brown to brown. Brown is the most frequent eye color worldwide. People with brown eyes have a large amount of melanin in the iris, while people with blue eyes have less melanin.

Interpretation

As per your genotype, you have a typical likelihood of having dark colored eyes. Dark colored eyes are more prevelant in people from African and Asian continents.

Gene Table

Gene Name: VASH2 | Your Genotype: GA

VASH2 (Vasohibin 2) is a Protein Coding gene. Tyrosine carboxypeptidase that removes the C-terminal tyrosine residue of alpha-tubulin, thereby regulating microtubule dynamics and function. Acts as an activator of angiogenesis: expressed in infiltrating mononuclear cells in the sprouting front to promote angiogenesis

Gene Name: TYR | Your Genotype: GG

The TYR gene provides instructions for making an enzyme called tyrosinase. This enzyme is located in melanocytes, which are specialized cells that produce a pigment called melanin. Melanin is the substance that gives skin, hair, and eyes their color. Melanin is also found in the light-sensitive tissue at the back of the eye (the retina), where it plays a role in normal vision.

Gene Name: Near SLC24A4 | Your Genotype: GT

This gene encodes a member of the potassium-dependent sodium/calcium exchanger protein family. Alternative splicing results in multiple transcript variants.This gene suggests a role for the SLC24A4 gene in variations in hair and eye pigmentation.

Gene Name: OCA | Your Genotype: GA

The OCA2 gene (formerly called the P gene) provides instructions for making a protein called the P protein. This protein is located in melanocytes, which are specialized cells that produce a pigment called melanin. Melanin is the substance that gives skin, hair, and eyes their color. Melanin is also found in the light-sensitive tissue at the back of the eye (the retina), where it plays a role in normal vision.

Gene Name: HERC2 | Your Genotype: TT

HERC2 is a giant E3 ubiquitin protein ligase, implicated in DNA repair regulation, pigmentation and neurological disorders. It is encoded by a gene of the same name belonging to the HERC family, which typically encodes large protein products with C-Terminal HECT domains and one or more RCC1-like (RLD) domains. This gene belongs to the HERC gene family that encodes a group of unusually large proteins, which contain multiple structural domains.

Gene Name: SLC45A2 | Your Genotype: CC

SLC45A2 (also called MATP) gene encodes a membrane associated transporter protein involved in arranging melanogenic enzymes during melanosome maturation. It has been previously defined as a human pigmentation related and melanoma susceptibility gene. The protein is expressed in a high percentage of melanoma cell lines. These cells produce a pigment called melanin, which is the substance that gives skin, hair, and eyes their color. Melanin is also found in the light-sensitive tissue at the back of the eye (the retina), where it plays a role in normal vision.

Gene Name: IRF4 | Your Genotype: CT

IRF4 gene, encoding a member of a helix-loophelix family of DNA-binding transcription factors involved in downstream regulation of interferon signaling. IRFs are primarily associated with immune system development and response. IRF4 is predominantly expressed in lymphocytes, macrophages, B-cells and dendritic cells, but also in melanocytic lineages. The IRFs are important in the regulation of interferons in response to infection by virus, and in the regulation of interferon-inducible genes. This family member is lymphocyte specific and negatively regulates Toll-like-receptor (TLR) signaling that is central to the activation of innate and adaptive immune systems. A chromosomal translocation involving this gene and the IgH locus, may be a cause of multiple myeloma

Skin Colour

What is Skin Colour ?

Skin color or pigmentation depends on the level of melanin. Skin color in humans beings ranges from dark brown to pale white. Greater sun exposure leads to increased melanin production. Therefore, geographical areas that receive higher amounts of ultraviolet radiation, generally located closer to the equator, tend to have darker-skinned populations. Areas closer to the poles have lower intensity of ultraviolet radiation, which is reflected in lighter-skinned populations. Light or pale skin is better at absorbing vitamin D.

Interpretation

As per your genotype, you have an equal probability of developing light or dark skin. However, along with genetics, other factors such as exposure to ultraviolet radiation, e.g. tanning beds, exposure to sun, also influences skin color.

Gene Table

Gene Name: TYR | Your Genotype: CC

The TYR gene provides instructions for making an enzyme called tyrosinase. This enzyme is located in melanocytes, which are specialized cells that produce a pigment called melanin. Melanin is the substance that gives skin, hair, and eyes their color. Melanin is also found in the light-sensitive tissue at the back of the eye (the retina), where it plays a role in normal vision.

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Gene Name: Near SLC24A5 | Your Genotype: TT

SLC24A5 gene encodes a member of the potassium-dependent sodium/calcium exchanger protein family. SLC24A5 is a cation exchanger involved in pigmentation, possibly by participating in ion transport in melanosomes. Predominant sodium-Calcium exchanger in melanocytes. Probably transports 1 Ca2+ and 1 K+ to the melanosome in exchange for 4 cytoplasmic Na+. Mutations in this gene are associated with oculocutaneous albinism.

Gene Name: SLC24A5 | Your Genotype: AA

SLC24A5 gene encodes a member of the potassium-dependent sodium/calcium exchanger protein family. SLC24A5 is a cation exchanger involved in pigmentation, possibly by participating in ion transport in melanosomes. Predominant sodium-Calcium exchanger in melanocytes. Probably transports 1 Ca2+ and 1 K+ to the melanosome in exchange for 4 cytoplasmic Na+. Mutations in this gene are associated with oculocutaneous albinism.

Gene Name: MYEF2 | Your Genotype: TT

MYEF2 (Myelin Expression Factor 2) is a Protein Coding gene. Diseases associated with MYEF2 include Albinism, Oculocutaneous, Type Vi and Lung Cancer.

Gene Name: CTXN2 | Your Genotype: TT

The CTXN2 gene is responsible for extracellular deposits and cytoplasmic expression in several different tissues

Gene Name: DUT | Your Genotype: TT

This enzyme is involved in nucleotide metabolism: it produces dUMP, the immediate precursor of thymidine nucleotides and it decreases the intracellular concentration of dUTP so that uracil cannot be incorporated into DNA.

Gene Name: SLC45A2 | Your Genotype: CC

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Gene Name: IRF4 | Your Genotype: CT

IRF4 gene, encoding a member of a helix-loophelix family of DNA-binding transcription factors involved in downstream regulation of interferon signaling. IRFs are primarily associated with immune system development and response. IRF4 is predominantly expressed in lymphocytes, macrophages, B-cells and dendritic cells, but also in melanocytic lineages. The IRFs are important in the regulation of interferons in response to infection by virus, and in the regulation of interferon-inducible genes. This family member is lymphocyte specific and negatively regulates Toll-like-receptor (TLR) signaling that is central to the activation of innate and adaptive immune systems.

Gene Name: Near BCN2 | Your Genotype: GG

Basonuclin 2 (BNC2) is one of the most evolutionaryconserved DNA-binding zinc-finger proteins expressed in many human tissues, including epithelial and germ cells. BNC2 is most likely involved in mRNA splicing or other forms of mRNA processing, but it has also been suggested to function as a transcription factor. BNC2 is detected in all layers of the human epidermis, where it resides in nuclear speckles. It was demonstrated here that BNC2 is differentially expressed in melanocyte cell lines originating from differently pigmented donors, which suggests that BNC2 does act on pigmentation through melanocytes, at least in humans. We showed that the expression levels of BNC2 in melanocytes depend on the allelic status of BNC2 rs12350739, which in turn corresponds with the pigmentation phenotype.

Gene Name: OCA2 | Your Genotype: AA

The OCA2 gene (formerly called the P gene) provides instructions for making a protein called the P protein. This protein is located in melanocytes, which are specialized cells that produce a pigment called melanin. Although the exact function of the P protein is unknown, it is essential for normal pigmentation and is likely involved in the production of melanin. Within melanocytes, the P protein may transport molecules into and out of structures called melanosomes (where melanin is produced). Researchers believe that this protein may also help regulate the relative acidity (pH) of melanosomes. Tight control of pH is necessary for most biological processes.

Gene Name: MC1R | Your Genotype: CC

The MC1R gene provides instructions for making a protein called the melanocortin 1 receptor. This receptor plays an important role in normal pigmentation. The receptor is primarily located on the surface of melanocytes, which are specialized cells that produce a pigment called melanin. Melanin is the substance that gives skin, hair, and eyes their color. This intronless gene encodes the receptor protein for melanocyte-stimulating hormone (MSH). The encoded protein, a seven pass transmembrane G protein coupled receptor, controls melanogenesis. This receptor is a major determining factor in sun sensitivity.

Do's and Don'ts

Do's

- Take extra precautions to increase and maintain your vitamin D levels since darker skin is more susceptible to vitamin D deficiency.
- Get sun exposure for 30 mins before 10 am.
- You should consume foods rich in vitamin D such as beef liver, egg yolk, fatty fish, like tuna, mackerel and salmon, and fortified foods like orange juice, soy milk and cereals. Get your vitamin D levels checked regularly.
- It is recommended to apply water-resistant sunscreen with SPF 30 or greater and broad-spectrum protection against UVA and UVB rays, at least 15-30 minutes before sun exposure.
- Use broad-brimmed hats, protective clothing, and good quality sunglasses to avoid skin damage from sun exposure.

Don'ts

- Avoid sun exposure between 10 am to 4 pm; the sun's rays are strongest during these hours and overexposure can lead to skin damage.
- Do not ignore any abnormal skin lesions; consult a dermatologist.

Category Summary

PHOTOAGING

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Sun Spots

What is Sun Spots ?

Sunspots are harmless, noncancerous flat brown spots that develop on areas of skin which are exposed to the sun, such as face, shoulders, back, and the backs of the hands. They do not pose any risk to the health or require treatment unless for cosmetic reasons. These discoloration spots can be tan or varying shades of brown. They often start to appear around the age of 40 years, though some people may develop them earlier or later in life, depending on the amount of sun exposure they have had.

7.4

Sun Spots

Interpretation

As per your genotype, you have a slightly elevated risk of developing sun spots. Exposure to UV light from sun or artificial sources without taking preventive measures, working outdoors, geographical location (such as high altitude and proximity to the equator, where the harmful effects of ultraviolet light from the sun are most severe), and indoor tanning can increase the risk of developing sun spots.

Gene Table

Gene Name: Near STXBP5L | Your Genotype: GG

Syntaxin 1 is a component of the 7S and 20S SNARE complexes which are involved in docking and fusion of synaptic vesicles with the presynaptic plasma membrane. This gene encodes a syntaxin 1 binding protein. In rat, a similar protein dissociates syntaxin 1 from the Munc18/n-Sec1/rbSec1 complex to form a 10S complex, an intermediate which can be converted to the 7S SNARE complex. Thus this protein is thought to be involved in neurotransmitter release by stimulating SNARE complex formation. Alternatively spliced variants have been identified, but their biological validity has not been determined.

Gene Name: SLC45A2

Your Genotype: AG

SLC45A2 (also called MATP) gene encodes a membrane associated transporter protein involved in arranging melanogenic enzymes during melanosome maturation. It has been previously defined as a human pigmentation related and melanoma susceptibility gene. The protein is expressed in a high percentage of melanoma cell lines. Mutations in this gene are a cause of oculocutaneous albinism type 4, and polymorphisms in this gene are associated with variations in skin and hair color.

Do's and Don'ts

Do's

- It is recommended to apply water-resistant sunscreen with SPF 30 or higher and broad-spectrum protection against UVA and UVB rays, at least 15-30 minutes before sun exposure. Consult your dermatologist to choose the most suitable sunscreen.
- Use broad-brimmed hats, protective clothing, and good quality sunglasses to avoid skin damage from sun exposure.
- Consuming vitamin C rich foods like citrus fruits and berries, watermelon, guavas, pomegranate, potatoes, tomatoes, cucumber, oatmeal, and green tea are found to provide protection against the harmful effects of UV radiation from the sun. Sources of omega 3 fatty acids such as salmon and chia seeds, and beta-carotene foods such as carrots are also beneficial.
- Drink plenty of water to avoid dehydration.

Don'ts

- Avoid sun exposure between 10 am to 4 pm; the sun's rays are strongest during these hours and can lead to skin damage.
- Do not ignore any abnormal skin lesions; consult a dermatologist.
- Avoid using tanning beds.

Sunburns

What is Sunburns ?

Sunburn is the skin's reaction to overexposure to ultraviolet radiation, either from sunlight or artificial sources. It manifests as red, inflamed patches on the exposed skin. Development of sunburns depend on the intensity of ultraviolet radiation and genetic capability to produce melanin. In fair-skinned people, melanin levels are low, therefore ultraviolet rays penetrate the upper layer of the skin and cause direct DNA damage, triggering several defence mechanisms.

4.9

Sunburns

Interpretation

As per your genotype, you have a typical risk of developing sunburns. However, other factors like light/pale complexion, light colored eyes or hair, prolonged exposure to UV light from sun or artificial sources without taking preventive measures, working outdoors, history of sunburns, and photosensitizing drugs (drugs that increase your sensitivity to light) can increase the risk of developing sunburns.

Gene Table

Gene Name: TYR | Your Genotype: GG

The TYR gene provides instructions for making an enzyme called tyrosinase. This enzyme is located in melanocytes, which are specialized cells that produce a pigment called melanin. Melanin is the substance that gives skin, hair, and eyes their color. Melanin is also found in the light-sensitive tissue at the back of the eye (the retina), where it plays a role in normal vision.

Gene Name: HERC2 | Your Genotype: TT

HERC2 is a giant E3 ubiquitin protein ligase, implicated in DNA repair regulation, pigmentation and neurological disorders. It is encoded by a gene of the same name belonging to the HERC family, which typically encodes large protein products with C-Terminal HECT domains and one or more RCC1-like (RLD) domains. This gene belongs to the HERC gene family that encodes a group of unusually large proteins, which contain multiple structural domains. The HERC2 locus is also associated with human pigmentation variation, through the modification of the expression of OCA2, a pigmentation gene contiguous to HERC2.

Gene Name: SLC45A2 | Your Genotype: CC

SLC45A2 (also called MATP) gene encodes a membrane associated transporter protein involved in arranging melanogenic enzymes during melanosome maturation. It has been previously defined as a human pigmentation related and melanoma susceptibility gene. The protein is expressed in a high percentage of melanoma cell lines.

Gene Name: IRF4 | Your Genotype: CT

IRF4 gene, encoding a member of a helix-loophelix family of DNA-binding transcription factors involved in downstream regulation of interferon signaling. IRFs are primarily associated with immune system development and response. IRF4 is predominantly expressed in lymphocytes, macrophages, B-cells and dendritic cells, but also in melanocytic lineages. The IRFs are important in the regulation of interferons in response to infection by virus, and in the regulation of interferon-inducible genes. This family member is lymphocyte specific and negatively regulates Toll-like-receptor (TLR) signaling that is central to the activation of innate and adaptive immune systems. This interferon regulatory factor cooperates with MITF to activate the expression of tyrosinase in melanocytes. This function seems to be impaired in carriers of the rs12203592*T derived minor allele.

Gene Name: MC1R | Your Genotype: GG

Melanocortin-1 receptor is an important gene for melanogenesis, and it codes for the G-protein-coupled receptor on melanocytes. The binding of the alpha-melanocyte-stimulating hormone (a-MSH) to the receptor is positively linked to the cAMP-signaling pathway, resulting in a switch from the biosynthesis of pheomelanin to that of eumelanin. The MC1R gene provides instructions for making aprotein called the melanocortin 1 receptor. This receptor plays an important role in normal pigmentation. The receptor is primarily located on the surface of melanocytes, which are specialized cells that produce a pigment called melanin. This intronless gene encodes the receptor protein for melanocyte-stimulating hormone (MSH). The encoded protein, a seven pass transmembrane G protein coupled receptor, controls melanogenesis. Two types of melanin exist: red pheomelanin and black eumelanin. Gene mutations that lead to a loss in function are associated with increased pheomelanin production, which leads to lighter skin and hair color. Eumelanin is photoprotective but pheomelanin may contribute to UV-induced skin damage by generating free radicals upon UV radiation. Binding of MSH to its receptor activates the receptor and stimulates eumelanin synthesis. This receptor is a major determining factor in sun sensitivity and is a genetic risk factor for melanoma and non-melanoma skin cancer. Over 30 variant alleles have been identified which correlate with skin and hair color, providing evidence that this gene is an important component in determining normal human pigment variation.

Do's and Don'ts

Do's

- It is recommended to apply water-resistant sunscreen with SPF 30 or higher and broad-spectrum protection against UVA and UVB rays, at least 15-30 minutes before sun exposure. Consult your dermatologist to choose the most suitable sunscreen.
- Use broad-brimmed hats, protective clothing, and good quality sunglasses to avoid skin damage from sun exposure.
- Consuming vitamin C rich foods like citrus fruits and berries, watermelon, guavas, pomegranate, potatoes, tomatoes, cucumber, oatmeal, and green tea are found to provide protection against the harmful effects of ultraviolet radiation from the sun. Sources of omega 3 fatty acids such as salmon and chia seeds, and beta-carotene rich foods such as carrots are also beneficial.
- Drink plenty of water to avoid dehydration.

Don'ts

- Avoid sun exposure between 10 am to 4 pm; the sun's rays are strongest during these hours and can lead to skin damage.
- Do not ignore any abnormal skin lesions; consult a dermatologist.
- Avoid using tanning beds.

Freckles

What is Freckles ?

Freckles are benign skin lesions. They are clusters of small brown spots on your skin mainly on the face, neck, chest and arm, which usually are the areas that get direct sun exposure. Freckles are thought to develop as a result of a combination of genetic predisposition and sun exposure. People with blond or red hair, light-colored eyes, and fair skin have low melanin levels and are more susceptible to the damaging effect of UV rays and therefore likely to develop freckles. People with freckles are at a higher risk for skin cancer.

Interpretation

As per your genotype, you have a typical risk of developing freckles. However, other factors like overexposure to UV radiation from the sun or artificial sources can increase your risk of developing freckles.

Gene Table

Gene Name: MC1R | Your Genotype: GG

Melanocortin-1 receptor is an important gene for melanogenesis, and it codes for the G-protein-coupled receptor on melanocytes. The binding of the alpha-melanocyte-stimulating hormone (a-MSH) to the receptor is positively linked to the cAMP-signaling pathway, resulting in a switch from the biosynthesis of pheomelanin to that of eumelanin. The MC1R gene provides instructions for making aprotein called the melanocortin 1 receptor. This receptor plays an important role in normal pigmentation. The receptor is primarily located on the surface of melanocytes, which are specialized cells that produce a pigment called melanin. This intronless gene encodes the receptor protein for melanocyte-stimulating hormone (MSH). The encoded protein, a seven pass transmembrane G protein coupled receptor, controls melanogenesis. Two types of melanin existS: red pheomelanin and black eumelanin. Gene mutations that lead to a loss in function are associated with increased pheomelanin production, which leads to lighter skin and hair color. Eumelanin is photoprotective but pheomelanin may contribute to UV-induced skin damage by generating free radicals upon UV radiation. Binding of MSH to its receptor activates the receptor and stimulates eumelanin synthesis. This receptor is a major determining factor in sun sensitivity and is a genetic risk factor for melanoma and non-melanoma skin cancer. Over 30 variant alleles have been identified which correlate with skin and hair color, providing evidence that this gene is an important component in determining normal human pigment variation.

Gene Name: IRF4 | Your Genotype: CT

The protein encoded by this gene belongs to the IRF (interferon regulatory factor) family of transcription factors, characterized by an unique tryptophan pentad repeat DNA-binding domain. The IRFs are important in the regulation of interferons in response to infection by virus, and in the regulation of interferon-inducible genes. This family member is lymphocyte specific and negatively regulates Toll-like-receptor (TLR) signaling that is central to the activation of innate and adaptive immune systems. IRF4 gene, encoding a member of a helix-loophelix family of DNA-binding transcription factors involved in downstream regulation of interferon signaling. IRF4 is predominantly expressed in lymphocytes, macrophages, B-cells and dendritic cells, but also in melanocytic lineages.

Gene Name: BNC2 | Your Genotype: CC

This gene encodes a conserved zinc finger protein. The encoded protein functions in skin color saturation. Mutations in this gene are associated with facial pigmented spots.

Do's and Don'ts

Do's

- It is recommended to apply water-resistant sunscreen with an SPF of 30 or greater and broad-spectrum protection against UVA and UVB rays 15 - 30 minutes before exposure. Consult your dermatologist to choose the most suitable sunscreen.
- Wear UVA and UVB protected sunglasses when outdoors.
- Consuming citrus fruits, such as oranges and berries can help in protecting against the harmful effects of sun exposure. Almond, pistachios, and olive oil are a good source of vitamin E. Green tea and black tea are antioxidants, which can protect the body against the harmful effects of UV radiation. Omega 3 fatty acids such as salmon, chia seeds, and beta-carotene foods such as carrots have been found to do wonders for damaged skin.
- Drink plenty of water to avoid dehydration.
- In case you have freckles, consult a dermatologist as freckles can sometimes cause skin cancer.

Don'ts

- Avoid sun exposure between 10 am to 4 pm; the sun's rays are strongest during these hours and can lead to severe skin damage.
- Do not ignore any abnormal skin lesions; consult a dermatologist.

Tanning Ability

What is Tanning ability ?

Tanning ability is a protective response of your skin on overexposure to ultraviolet light. The skin increases the production of melanin and distributes it to the affected region preventing further damage of the genetic material (DNA). People with good tanning ability have a lowered risk of skin cancer and can produce a natural tan that provides a modest Sun Protection Factor (SPF). People with light skin, blue eyes, and red or blond hair have a poor ability to tan. Over exposure to ultraviolet radiation and decreased tanning ability significantly increases the risk for skin cancer.

4.8

Tanning ability

Interpretation

As per your genotype, you have a typical tanning ability, which represents the ability of the skin to protect itself against ultraviolet (UV) radiation. However, people with light skin, blue eyes, and red or blond hair have a poor tanning ability which may increase the risk for conditions like sunburns, skin cancer, or eye damage.

Gene Table

Gene Name: TYR | Your Genotype: GG

The TYR gene provides instructions for making an enzyme called tyrosinase. This enzyme is located in melanocytes, which are specialized cells that produce a pigment called melanin. Melanin is the substance that gives skin, hair, and eyes their color. Melanin is also found in the light-sensitive tissue at the back of the eye (the retina), where it plays a role in normal vision.

Gene Name: HERC2 | Your Genotype: TT

This gene belongs to the HERC gene family that encodes a group of unusually large proteins, which contain multiple structural domains. All members have at least 1 copy of an N-terminal region showing homology to the cell cycle regulator RCC1 and a C-terminal HECT (homologous to E6-AP C terminus) domain found in a number of E3 ubiquitin protein ligases. HERC2 is a giant E3 ubiquitin protein ligase, implicated in DNA repair regulation, pigmentation and neurological disorders. Genetic variations in this gene are associated with skin/hair/eye pigmentation variability.

Gene Name: Near MC1R | Your Genotype: TT

Melanocortin-1 receptor is an important gene for melanogenesis, and it codes for the G-protein-coupled receptor on melanocytes. The binding of the alpha-melanocyte-stimulating hormone (a-MSH) to the receptor is positively linked to the cAMP-signaling pathway, resulting in a switch from the biosynthesis of pheomelanin to that of eumelanin. The MC1R gene provides instructions for making aprotein called the melanocortin 1 receptor. This receptor plays an important role in normal pigmentation. The receptor is primarily located on the surface of melanocytes, which are specialized cells that produce a pigment called melanin. This intronless gene encodes the receptor protein for melanocyte-stimulating hormone (MSH). The encoded protein, a seven pass transmembrane G protein coupled receptor, controls melanogenesis. Two types of melanin exist: red pheomelanin and black eumelanin. Gene mutations that lead to a loss in function are associated with increased pheomelanin production, which leads to lighter skin and hair color. Eumelanin is photoprotective but pheomelanin may contribute to UV-induced skin damage by generating free radicals upon UV radiation. Binding of MSH to its receptor activates the receptor and stimulates eumelanin synthesis. This receptor is a major determining factor in sun sensitivity and is a genetic risk factor for melanoma and non-melanoma skin cancer. Over 30 variant alleles have been identified which correlate with skin and hair color, providing evidence that this gene is an important component in determining normal human pigment variation. MC1R, is a well-established pigmentation gene encoding a 317-amino acid. 7-pass-transmembrane G protein-coupled receptor. As the rate-limiting step in the activation of the cAMP pathway in terms of melanin production, MC1R has been strongly associated with pigmentary phenotypes, especially with red-hair color phenotype.

Gene Name: SLC45A2 | Your Genotype: CC

SLC45A2 (also called MATP) gene encodes a membrane associated transporter protein involved in arranging melanogenic enzymes during melanosome maturation. It has been previously defined as a human pigmentation related and melanoma susceptibility gene. The protein is expressed in a high percentage of melanoma cell lines. The MATP, a membrane-associated transporter protein, has been considered as a sodium-hydrogen exchanger of melanosomes, regulating tyrosinase activity in human melanocyte.

Gene Name: IRF4 | Your Genotype: CT

IRF4 gene, encoding a member of a helix-loophelix family of DNA-binding transcription factors involved in downstream regulation of interferon signaling. IRFs are primarily associated with immune system development and response. IRF4 is predominantly expressed in lymphocytes, macrophages, B-cells and dendritic cells, but also in melanocytic lineages. The IRFs are important in the regulation of interferons in response to infection by virus, and in the regulation of interferon-inducible genes. This family member is lymphocyte specific and negatively regulates Toll-like-receptor (TLR) signaling that is central to the activation of innate and adaptive immune systems. The IRF4 gene product is a member of the interferon regulatory factor family of transcription factors, which are involved in the regulation of gene expression in response to interferon and other cytokines. It binds to the interferon-stimulated response element (ISRE) of the MHC class I promoter thereby playing an important role in pigmentation.

Gene Name: TRPS1 | Your Genotype: CC

The TRPS1 gene provides instructions for making a protein that regulates the activity of many other genes. The TRPS1 protein is found within the cell nucleus where it interacts with specific regions of DNA to turn off (repress) gene activity. Based on this role, the TRPS1 protein is called a transcription factor

Gene Name: Near TYRP1 | Your Genotype: TT

The TYRP1 gene provides instructions for making an enzyme called tyrosinase-related protein 1. This enzyme is located in melanocytes, which are specialized cells that produce a pigment called melanin.

Gene Name: MC1R | Your Genotype: CC

Melanocortin-1 receptor is an important gene for melanogenesis, and it codes for the G-protein-coupled receptor on melanocytes. The binding of the alpha-melanocyte-stimulating hormone (a-MSH) to the receptor is positively linked to the cAMP-signaling pathway, resulting in a switch from the biosynthesis of pheomelanin to that of eumelanin. The MC1R gene provides instructions for making aprotein called the melanocortin 1 receptor. This receptor plays an important role in normal pigmentation. The receptor is primarily located on the surface of melanocytes, which are specialized cells that produce a pigment called melanin. This intronless gene encodes the receptor protein for melanocyte-stimulating hormone (MSH). The encoded protein, a seven pass transmembrane G protein coupled receptor, controls melanogenesis. Two types of melanin exist: red pheomelanin and black eumelanin. Gene mutations that lead to a loss in function are associated with increased pheomelanin production, which leads to lighter skin and hair color. Eumelanin is photoprotective but pheomelanin may contribute to UV-induced skin damage by generating free radicals upon UV radiation. Binding of MSH to its receptor activates the receptor and stimulates eumelanin synthesis. This receptor is a major determining factor in sun sensitivity and is a genetic risk factor for melanoma and non-melanoma skin cancer. Over 30 variant alleles have been identified which correlate with skin and hair color, providing evidence that this gene is an important component in determining normal human pigment variation. MC1R, is a well-established pigmentation gene encoding a 317-amino acid. 7-pass-transmembrane G protein-coupled receptor. As the rate-limiting step in the activation of the cAMP pathway in terms of melanin production, MC1R has been strongly associated with pigmentary phenotypes, especially with red-hair color phenotype.

Gene Name: RALY | Your Genotype: GG

RNA-binding protein that acts as a transcriptional cofactor for cholesterol biosynthetic genes in the liver.

Do's and Don'ts

Do's

- It is recommended to apply water-resistant sunscreen with an SPF of 30 or greater and broad-spectrum protection against UVA and UVB rays 15-30 minutes before exposure. Consult your dermatologist to choose the most suitable sunscreen.
- Wear sunglasses with UVA and UVB protection when outdoors.
- Drink plenty of water to avoid dehydration.

Don'ts

- Avoid sun exposure between 10 am to 4 pm; the sun's rays are strongest during these hours and can lead to severe skin damage.
- Do not ignore any abnormal skin lesions; consult a dermatologist.
- Avoid getting artificial tans from tanning beds. Artificial tanning beds expose people to higher dosage of damaging ultraviolet light than the sun.

Category Summary

CHRONIC INFLAMMATORY AUTOIMMUNE CONDITIONS

7.1

Psoriasis

Psoriasis

What is Psoriasis ?

Psoriasis is an autoimune skin disease leading to faster growth of skin cells. It is characterized by red patches of skin covered with thick, silvery scales and small scaling spots. An overactive immune system causes T-cells (immune cells)to attack healthy skin cells, resulting in increased production of healthy skin cells, which leads to scaly patches, redness, and sometimes pus. Other conditions associated with psoriasis include cardiovascular diseases, obesity, diabetes, metabolic syndrome, Inflammatory Bowel Disease (IBD), and psoriatic arthritis, which contribute to decreased longevity.

7.1

Psoriasis

Interpretation

As per your genotype, you have a slightly elevated risk of developing psoriasis. Other factors such as cold weather, physical trauma, certain drugs and infections, as well as modifiable variables such as psychological stress, obesity, smoking, and alcohol can increase the risk of developing and worsening of psoriasis.

Gene Table

Gene Name: IL23R | Your Genotype: CC

IL-23 supports the proliferation and survival of Th17 cells. Th17 cells may play an important role in maintaining chronic inflammation in psoriasis, Crohn disease, and other autoinflammatory conditions. The fact that common alleles at IL12B and/or IL23R confer risk for Crohn disease as well as psoriasis may help to explain the impressive results of clinical trials targeting the p40 subunit in both disorders. It is of great interest to explore how variation in the IL12B and IL23R genes influences clinical responses of psoriasis and Crohn disease to therapies directed against p40, and how they influence the number and functional activity of Th17 cells in both disorders.

Gene Name: IL10 | Your Genotype: CC

IL-10 is an anti-inflammatory and immunosuppressive cytokine that plays a significant role in the regulation of immune responses. The human IL-10 gene is positioned in the chromosome region 1q31–q32. The relative deficiency of the anti-inflammatory cytokines (IL-4 and IL-10) and the T-reg cells is a remarkable feature of the complex immunological aetiology of psoriasis.

Gene Name: ADAM33 | Your Genotype: CG

Several studies have suggested that psoriasis might be associated with A disintegrin and metalloprotease 33 (ADAM33). ADAM33, a member of the ADAM protein family, is located on chromosome 20p13. Its function is not well understood; its product is expressed in a variety of tissues, including the skin, and has been identified as an asthma and bronchial hyper-responsiveness susceptibility gene. Furthermore, ADAM33 has been correlated with many immune-mediated disorders.

Gene Name: TRAF3IP2 | Your Genotype: CC

TRAF3IP2 protein is involved in inflammatory pathways, including cytokine signaling. This gene encodes a protein involved in regulating responses to cytokines by members of the Rel/NF-kappaB transcription factor family. These factors play a central role in innate immunity in response to pathogens, inflammatory signals and stress.

Gene Name: TNFAIP3 | Your Genotype: GT

The TNFAIP3 gene encodes A20, a TNF-alpha-inducible zinc finger protein. A20 plays an important role in the negative feedback regulation of NF-kappa B (nuclear factor kappa light-chain enhancer of activated B cells) signalling, as a negative immunoregulatory protein. Moreover, A20 also regulates TNF-induced apoptosis and acts at multiple steps in the NF-kappa B signalling pathway. A20 protein could restrict activation of T cells by directly inhibiting NF-jB activation or downregulating the T cell stimulatory capacity of dendritic cells.

Gene Name: IL17F | Your Genotype: TC

Th17 cells produce IL-17A, IL-17F and IL-22, which are responsible for the formation of psoriatic plaques. The protein encoded by this gene is a cytokine that shares sequence similarity with IL17. This cytokine is expressed by activated T cells, and has been shown to stimulate the production of several other cytokines, including IL6, IL8, and CSF2/GM-CSF.

Gene Name: JAK2 | Your Genotype: AA

Several important cytokines involved in the psoriasis inflammatory cascade, such as IL-6, IL-12 and IL-23, signal through the Janus kinase/signal transducer and activator of transcription (JAK/STAT) pathway [14]. In this pathway, cytokine receptors recruit two members of the JAK family (JAK1, JAK2, JAK3 or tyrosine kinase 2) into a signalling complex. In particular, in Th17 cells, the IL-23 receptor recruits JAK2 and tyrosine kinase 2 (TYK2) activating STAT-3 sequentially.

Do's and Don'ts

Do's

- Maintain a healthy diet and body weight as per your Body Mass Index (BMI) to reduced risk of comorbidities associated with psoriasis.
- Maintain good skin hygiene.
- Consult a doctor if you experience any symptoms of psoriasis and observe redness, around skin lesions, pus, pain or swelling of lesions or lymph nodes, and fever.
- Inform your doctor of all the medications you are taking to ensure that they do not trigger the condition.
- If you are diagnosed with psoriasis, expose your skin to small doses of sunlight as ultraviolet radiation from the sun can help slow down the skill cell growth.

Don'ts

- Avoid stressful conditions.
- Avoid using skin or hair products which are harsh and which may dry out the skin.
- Do not scratch your skin or scalp violently.
- Avoid smoking and excess consumption of alcohol.

Category Summary

CHRONIC INFLAMMATORY CONDITIONS

6.8

Eczema

Eczema

What is Eczema ?

Eczema refers to various conditions causing inflammation of the skin. Atopic Dermatitis (AD) is the commonest type of eczema. It is a chronic relapsing inflammatory skin disease that is commonly associated with food allergy, allergic rhinitis, and asthma. AD usually develops in early childhood and is more common in people who have a family history of the condition. Extremes of hot and cold weather are poorly tolerated by patients with AD and can lead to sweating and dry skin leading to itchy skin. In childhood, wool has been found to be a known trigger for AD.

6.8

Eczema

Interpretation

As per your genotype, you have a slightly elevated risk of developing eczema. Other factors like the weather, certain viral infections, some cosmetics and fragrances, and food allergens can increase the risk of developing eczema. Exposure to environmental allergens such as dust mites, pollens, molds, cigarette smoke, and dander from animals may worsen symptoms of allegic dermatitis.

Gene Table

Gene Name: FLG | Your Genotype: CC

The protein encoded by this gene is an intermediate filament-associated protein that aggregates keratin intermediate filaments in mammalian epidermis. It is initially synthesized as a polyprotein precursor, profilaggrin (consisting of multiple filaggrin units of 324 amino acids each), which is localized in keratohyalin granules, and is subsequently proteolytically processed into individual functional filaggrin molecules. FLG is located within the epidermal differentiation complex (EDC) 1q21. The EDC is a dense cluster of genes involved in the terminal differentiation of the epidermis and formation of the stratum corneum. Filaggrin (FLG) is a key epidermal protein in facilitating the terminal differentiation of keratinocytes and thereby in maintaining normal skin barrier function and hydration. The impact of FLG gene variation on Atopic Dermatitis risk exceeds that of any other investigated candidate gene thus far.

Gene Name: STAT6 | Your Genotype: CT

Signal transducer and activator of transcription 6 (STAT6) is a key molecule in Th2-induced responses, such as IgE production and Atopic Dermatitis (AD) pathogenesis. IL-4/IL-13 induces the associated Janus kinases (JaKs) and JaKs phosphorylate the conserved tyrosine residue on the cytokine receptors; then STAT6 is recruited to the cytokine receptor and activated. Activated STAT6 may translocate to the nucleus and regulates gene transcription. STAT6 has been verified to regulate the production of IL-31, a pruritic factor of AD, and important skin barrier proteins under Th2 cytokine stimulation.

Gene Name: IL31 | Your Genotype: CC

IL31, which is made principally by activated Th2-type T cells, interacts with a heterodimeric receptor consisting of IL31RA and Oncostatin M Receptor that is constitutively expressed on epithelial cells and keratinocytes. IL31 may be involved in the promotion of allergic skin disorders and in regulating other allergic diseases, such as asthma. Interleukin-31 is a novel effector cytokine that is associated with atopic eczema-induced skin inflammation and itch in human beings. IL-31 is strongly associated with inflammatory skin condition characterized by intense itch. Association has been found for inflammatory mediator gene interleukin-31 (IL-31) with the occurrence of either atopic eczema or irritant hand dermatitis in different studies.

Gene Name: KIF3A | Your Genotype: CT

KIF3A encoding a motor subunit of kinesin-2, which is an important component in primary cilia formation. This gene is also implicated in Hedgehog signaling and beta-catenin-dependent Wnt signaling in the regulation of the expression of various genes that influence cell proliferation and apoptosis. Notably, KIF3A is located in the 5q31 region, which is characterized by a complex linkage disequilibrium (LD) pattern and contains cytokine clusters and immune-related genes thought to play an important role in the development of several autoimmune or inflammatory diseases, including asthma, psoriasis, and Crohn's disease.

Gene Name: SPINK5 | Your Genotype: GG

SPINK5 encodes a serine protease inhibitor that is responsible for Netherton syndrome, a rare genetic disorder that includes the features of atopic eczema. Dysfunction of SPINK5 may result in abnormal keratinocyte differentiation and disturbed skin barrier function. This gene encodes a multidomain serine protease inhibitor that contains 15 potential inhibitory domains. The encoded preproprotein is proteolytically processed to generate multiple protein products, which may exhibit unique activities and specificities. These proteins may play a role in skin and hair morphogenesis, as well as anti-inflammatory and antimicrobial protection of mucous epithelia. Mutations in this gene may result in Netherton syndrome, a disorder characterized by ichthyosis, defective cornification, and atopy.

Do's and Don'ts

Do's

- Consult a doctor for prompt treatment if you suffer from any kind of infection or allergy.
- Include anti-inflammatory foods like fish, a natural source of omega-3, and foods rich in probiotics like yogurt. Colorful fruits and vegetables, such as apples, broccoli, cherries, spinach, and kale must also be consumed.
- Moisturize your skin regularly to prevent dryness and itching.

Don'ts

- Avoid using clothing with scratchy fabric,and jewelry or clothing that contains potential irritants such as nickel.
- Avoid harsh soaps, detergents, and solvents.
- Avoid foods that may trigger eczema like citrus fruits, dairy, eggs, gluten or wheat, soy, some nuts.
- Test any new products on a small patch of skin to ensure they are safe and non-irritating.

Category Summary

AUTOIMMUNE DISORDERS

5.4

Vitiligo

5.1

Pemphigus Foliaceus

Vitiligo

What is Vitiligo ?

Vitiligo is an autoimmune disorder causing whitening of the skin and presents as milky white patches, caused due to destruction of pigment forming cells (melanocytes). There are two types of vitiligo, non-segmental vitiligo and segmental vitiligo. Non-segmental vitiligo is the commonest form, characterised by symmetrical and bilateral white patches. Segmental vitiligo lesions are characterised by unilateral and segmental or band-shaped distribution, with an early age of onset.

5.4

Vitiligo

Interpretation

As per your genotype, you have a typical risk of developing vitiligo. However, other factors like sunburn, exposure to ultraviolet radiation, industrial chemicals, and stress may increase your risk of developing vitiligo.

Gene Table

Gene Name: ZMIZ1 | Your Genotype: AG

ZMIZ1 encodes for the zinc finger protein MIZ type 1, which is a member of the protein inhibitors of activated STAT (PIAS) and biologically involved in the development, function and survival of melanocyte. Aside from its important role in melanocyte, ZMIZ1 can also regulate the TGF-?/SMAD signaling that has been clearly demonstrated to have an inhibitory effect on the immune system. In addition, ZMIZ1 may also play a role in the vitiligo pathogenesis by regulating the induction of autoreactive T cells and the loss of tolerance to melanocyte antigen.

Gene Name: IKZF4 | Your Genotype: CA

Studies demonstrated that the combining genetic and immunological pathways might lead to lymphocyte destruction and vitiligo with immune-related diseases. IKZF4 encoding Eos, a zinc finger transcription factor of the Ikaros family, is expressed in lymphocytes and is implicated in the control of lymphoid development.

Gene Name: CDK5RAP1 | Your Genotype: TC

Oxidative stress, which can induce apoptosis by releasing caspase-activating cytochrome C from mitochondria, may induce or contribute to the apoptosis of melanocytes in vitiligo lesions. A chemical genetic screen revealed that deregulated CDK5 may cause oxidative stress by compromising the cellular anti-oxidant defense system. CDK5RAP1 encodes for p35, a protein required for the activation of CDK5.

Gene Name: FOXP3 | Your Genotype: AA

The protein encoded by this gene is a member of the forkhead/winged-helix family of transcriptional regulators. Defects in this gene are the cause of immunodeficiency polyendocrinopathy, enteropathy, X-linked syndrome (IPEX), also known as X-linked autoimmunity-immunodeficiency syndrome. Regulatory T lymphocytes (Treg) are involved in the control of immune homeostasis by preventing autoimmune diseases. Treg are commonly identified by the intracellular expression of forkhead box P3 transcription factor (FOXP3) that controls their development and function. FOXP3 and ICOSL polymorphisms, modulating the activity of these immune-related genes, may predispose to AA by decreasing FOXP3 and ICOSLG expression at mRNA level. The human FOXP3 gene is located on chromosome Xp11.23 and consists of 11 exons. FOXP3 gene polymorphisms are known to alter FOXP3 protein expression and function, consequently, it is possible that polymorphisms in the FOXP3 promoter are associated with the development of vitiligo.

Gene Name: FOXO3A | Your Genotype: TC

Forkhead box class O (FOXO) proteins are a subclass family of the Forkhead box (FOX) transcription factors, including FOXO1, FOXO3A, FOXO4, and FOXO6 which play a crucial role in diverse cellular processes such as cell cycle regulation, apoptosis, oxidative stress and DNA repair. Studies have shown that FOXO3A have important roles in the regulation of oxidative stress. Activation of FOXO3A has been shown to induce gene expression of manganese superoxide dismutase (MnSOD) and catalase antioxidant enzymes. Taking into account the possible effects of oxidative stress and apoptosis in the pathophysiology of vitiligo, it was hypothesized that FOXO3A genetic variants might be associated with risk of vitiligo.

Gene Name: HLA-G | Your Genotype: TT

MHC class-I non-classical gene. HLA-G is considered as immune tolerization molecules and interact with natural killer (NK) cells, as well as T lymphocyte. Several studies suggested that HLA-G polymorphisms were associated with autoimmune diseases such juvenile idiopathic arthritis (JIA) and systemic lupus erythematosus. It is suggested that HLA-G could be implicated in the pathogenesis of autoimmune diseases, such as vitiligo, and HLA-G expression is associated with vitiligo.

Gene Name: PSMB8 | Your Genotype: CT

This gene is located in the class II region of the MHC. Expression of this gene is induced by gamma interferon and this gene product replaces catalytic subunit 3 (proteasome beta 5 subunit) in the immunoproteasome. Aberrant presentation of self-antigens by major histocompatibility complex (MHC) molecules to T lymphocytes is a hallmark of autoimmune disorders. The MHC region on chromosome 6 has been implicated in many genome-wide association studies in vitiligo. Major histocompatibility complex (MHC) class-II linked genes proteasome subunit beta 8 (PSMB8) and transporter associated with antigen processing 1 (TAP1), involved in antigen processing and presentation have been reported to be associated with several autoimmune diseases including vitiligo.

Gene Name: TAP1 | Your Genotype: AA

Transporter associated with antigen processing (TAP) genes are encoded in the MHC-II region of the human HLA locus. TAP is composed of two integral membrane proteins, TAP1 and TAP2, which assemble into a heterodimer that results in a four-domain transporter. TAP1 functions by providing candidate peptides to the MHC-I molecules within the peptide-loading complex and by transporting antigen peptides from the cytoplasm into the endoplasmic reticulum. TAP has been reported to be associated with several autoimmune diseases and few case-control studies have also shown genetic variants of TAP to be associated with vitiligo in ethnic Caucasians, suggesting a possible role in the antimelanocyte autoimmune response involved in the disease.

Gene Name: PSMB9 | Your Genotype: GG

The immunoproteasome PSMB have been reported to be associated with several autoimmune diseases. A few case-control studies have also shown genetic variants of PSMB to be associated with vitiligo in ethnic Caucasians, suggesting a possible role in the antimelanocyte autoimmune response involved in the disease. Proteasomes are responsible for degrading short-lived cytoplasmic proteins into peptides. Among its 28 subunits, the 20S proteasome includes two subunits known as PSMB8 (LMP7) and PSMB9 (LMP2).

Gene Name: AHR | Your Genotype: CC

The AHR gene maps to chromosome 7p15 and is about 50 kb in size, consisting of at least 11 exons and 10 introns. It is known that polymorphisms of the AHR gene have negative effects on the affinity and sensitivity of the AHR proteins and activation of the AHR signalling pathway. AHR is involved in many biological processes including the immune response, endocrine secretion system and low molecular chemical metabolism. Recent research suggested that AHR plays an important role in modulating melanogenesis.

Gene Name: PTPN22 | Your Genotype: GG

Protein tyrosine phosphatase non-receptor type (PTPN22) gene is mapped in the chromosomal region 1p13.3–p13.1. It codes for the phosphoprotein named lymphoid tyrosine phosphatase (LYP). This intracellular phosphatase acts as a suppressor of C-terminal Src kinase (Csk) that mediates T-cell activation by binding the proline-rich motif of the Src-homology-3 (SH3) domain. A polymorphism in PTPN22 interferes in the binding of phosphatase and Csk resulting in suppression of T-cell activation.

Gene Name: SLC44A4 | Your Genotype: GG

The protein encoded by this gene may be a sodium-dependent transmembrane transport protein involved in the uptake of choline by cholinergic neurons. Defects in this gene can cause sialidosis, a lysosomal storage disease.

Do's and Don'ts

Do's

- Check for signs of vitiligo as it can be associated with other autoimmune diseases.
- It is recommended to apply water-resistant sunscreen with an SPF of 30 or greater and broad-spectrum protection against UVA and UVB rays 15 - 30 minutes before exposure to avoid skin damage from sun exposure. Consult your dermatologist to choose the most suitable sunscreen.
- Consult a doctor to get prescribed topical treatments and therapy options.

Don'ts

- Avoid over exposure to the sun by wearing protective clothing and sunscreen.
- Avoid exposure to artificial sources of UV light such as tanning beds.
- Avoid exposure to industrial chemicals.

Pemphigus Foliaceus

What is Pemphigus Foliaceus ?

Pemphigus Foliaceus (PF) is an acquired autoimmune blistering disease, occuring when the immune system makes antibodies against the skin and mucous membranes. It is characterized by blisters, cuts, and crusty spots on the skin and mucous membranes. PF is usually found on the face, scalp, and upper chest and back. There are two predominant types of PF, idiopathic PF, which is seen in people universally and Fogo Selvagem, which is seen in people from distinct geographical areas.

5.1

Pemphigus Foliaceus

Interpretation

As per your genotype, you have a typical risk of developing pemphigus foliaceus. However, other factors such as malignancy, certain food groups which contain one or more of the following compounds, thiol, isothiocyanates, phenols, or tannins, and certain drugs like ramipril, cephalosporins, NSAIDs, quinolones, rifamycins, etc. can increase the risk of developing pemphigus foliaceus.

Gene Table

Gene Name: KLRG1 | Your Genotype: AG

Killer cell lectin-like receptor subfamily G member 1 (KLRG1) gene is in the natural killer (NK) cell complex (NKC) in the chromosomal region 12p13.The protein encoded by this gene belongs to the killer cell lectin-like receptor (KLR) family, which is a group of transmembrane proteins preferentially expressed in NK cells. KLRG1 codes for an inhibitory receptor expressed on the surface of mainly NK and CD4+ and CD8+ T cells, where it potentially raises their activation thresholds, ultimately preventing autoreactivity. This gene is among the six immune-related genes previously found to be differentially expressed in Pemphigus Foliaceus (PF). Polymorphisms overlapping with seed sequences can interfere with miRNA ligation, potentially disrupting or creating miRNA binding sites. The polymorphisms overlapping with predicted miRNA binding sites in the aforementioned PF-differentially expressed gene could be contributing to the variable mRNA levels. This study aims to unveil a functional mechanism for the association that may elucidate the KLRG1 mRNA differential levels previously observed in the disease.

Gene Name: MHC2TA | Your Genotype: AG

Gene Name: LAIR1 | Your Genotype: AA

The protein encoded by this gene is an inhibitory receptor found on peripheral mononuclear cells, including natural killer cells, T cells, and B cells. Inhibitory receptors regulate the immune response to prevent lysis of cells recognized as self. The gene is a member of both the immunoglobulin superfamily and the leukocyte-associated inhibitory receptor family. The gene maps to a region of 19q13.4 called the leukocyte receptor cluster, which contains at least 29 genes encoding leukocyte expressed receptors of the immunoglobulin superfamily. The encoded protein has been identified as an anchor for tyrosine phosphatase SHP-1, and may induce cell death in myeloid leukemias. Unpublished results have shown that LAIR1 mRNA levels were differentially expressed in T CD4+ cells of patients with pemphigus vulgaris (PV). PV is related to Pemphigus Foliaceus (PF) at the clinical and molecular levels. It is characterized by anti-DSG3 and often also antiDSG1 autoantibodies and by blistering predominantly in the suprabasal layer of the epidermis. In the light of these observations, it was considered that both LAIR1 and LAIR2 are strong candidates for PF susceptibility.

Gene Name: LAIR2 | Your Genotype: CC

The protein encoded by this gene is a member of the immunoglobulin superfamily. It was identified by its similarity to leukocyte-associated immunoglobulin-like receptor 1, a membrane-bound receptor that modulates innate immune response. The protein encoded by this locus is a soluble receptor that may play roles in both inhibition of collagen-induced platelet aggregation and vessel formation during placental implantation. This gene maps to a region of 19q13.4, termed the leukocyte receptor cluster, which contains 29 genes in the immunoglobulin superfamily. LAIR-2 regulates the inhibitory potential of LAIR-1 by binding the same ligands. Altered protein levels of LAIR-1 and LAIR-2 have been associated with several autoimmune disorders and inflammatory responses, such as systemic lupus erythematosus (SLE), rheumatoid arthritis (RA) and autoimmune thyroid diseases (Grave's and auto-immune thyroiditis). LAIR1 and LAIR2 genes are located at the chromosome 19 (19q13.4) within the leukocyte receptor complex (LRC). This region also contains the KIR (killer cell immunoglobulin-like receptors) cluster, previously studied in several Brazilian populations, with SNPs and differential expression associated with PF susceptibility.

Gene Name: KIR3DL2 | Your Genotype: TT

Killer cell immunoglobulin-like receptors (KIRs) are transmembrane glycoproteins expressed by natural killer cells and subsets of T cells. The KIR genes are polymorphic and highly homologous and they are found in a cluster on chromosome 19q13.4 within the 1 Mb leukocyte receptor complex (LRC). Activating KIR genes are often associated with protection in infectious diseases and susceptibility to autoimmunity. Pemphigus Foliaceus (PF) is strongly related to environmental factors, possibly due to substances contained in the saliva of hematophagous insects or to infectious microorganisms that trigger the disease in susceptible individuals. This particularity of PF may explain why activating KIR has been associated with protection against the development of this disease.

Do's and Don'ts

Do's

- Consult your doctor in case you are suffering from any type of malignancy.
- Inform your doctor about all medications you consume.
- Maintain proper hygiene of the mouth and regularly check for blisters.
- Consuming potassium rich food helps in maintaining fluid in the cell. Antioxidant rich food like berries, spinach, peas, avocado etc, can be taken except thiol, and phenol containing foods.
- If case of skin infections, consult a dermatologist and seek prompt treatment.

Don'ts

- Try to avoid foods in the alium group of vegetables (onions, garlic and leeks), as they might have an effect on triggering pemphigus for some individuals.
- Avoid medications that may worsen symptoms of pemphigus (if any).
- Avoid skin products that may further irritate the skin.
- Do not attempt to self diagnose or self treat pemphigus.