KRT10 gene

keratin 10

Normal Function

The *KRT10* gene provides instructions for making a protein called keratin 10. Keratins are a group of tough, fibrous proteins that form the structural framework of cells called keratinocytes that make up the skin, hair, and nails. Keratin 10 is produced in keratinocytes in the outer layer of the skin (the epidermis).

In the fluid-filled space inside these cells (the cytoplasm), the keratin 10 protein partners with a similar protein, keratin 1 (produced from the *KRT1* gene), to form molecules called keratin intermediate filaments. These filaments assemble into strong networks that provide strength and resiliency to the skin and protect it from being damaged by friction and other everyday physical stresses.

Health Conditions Related to Genetic Changes

Epidermolytic hyperkeratosis

Dozens of mutations in the *KRT10* gene have been found in people with epidermolytic hyperkeratosis. This condition is characterized by red, blistering skin at an early age and thick skin (hyperkeratosis) later in life. People with *KRT10* gene mutations typically have NPS-type epidermolytic hyperkeratosis, which features thick skin on many parts of the body but not the palms of the hands or soles of the feet.

Most *KRT10* gene mutations associated with epidermolytic hyperkeratosis change a single protein building block (amino acid) in the keratin 10 protein. These amino acid changes commonly occur in regions of the protein that play a role in intermediate filament formation. The mutations alter the keratin 10 protein and seem to affect how intermediate filaments interact with each other to form networks. The altered proteins still form intermediate filaments, but the intermediate filament networks are disorganized and do not function normally. Without a strong network, skin cells become fragile and are easily damaged, which can lead to blistering in response to friction or mild trauma. It is unclear how these mutations cause the overgrowth of keratinocytes that results in hyperkeratotic skin.

Ichthyosis with confetti

Mutations in the *KRT10* gene can cause another skin disorder known as ichthyosis with confetti (also called congenital reticular ichthyosiform erythroderma), which is characterized by red, scaly skin all over the body with small patches of normal skin that look like confetti. The patches of normal skin increase in number and size with age. The *KRT10* gene mutations involved in this condition, which are initially

found in every cell of the body, alter the genetic sequence that is used as a blueprint for protein production, leading to production of abnormal keratin 10 protein. The abnormal protein includes a region at the end with an excess of the amino acid arginine; this arginine-rich region is not found in the normal keratin 10 protein. Researchers believe that this abnormal amino acid sequence directs the protein into the nucleus of the cell, where it cannot form the strong network of intermediate filaments. Loss of this network disrupts the outer layer of skin, contributing to the development of red, scaly skin.

In some abnormal cells, the mutated gene corrects itself through a complex process by which genetic material is exchanged between chromosomes. As a result, normal keratin 10 protein is produced and remains in the cytoplasm. The cell becomes normal and, as it continues to grow and divide, forms patches of normal skin in people with ichthyosis with confetti.

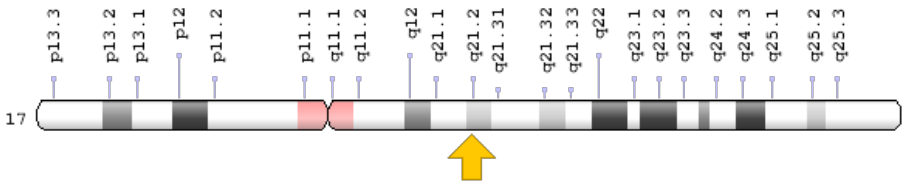
Other disorders

Cyclic ichthyosis with epidermolytic hyperkeratosis is another skin disorder caused by mutations in the *KRT10* gene. This condition is similar to epidermolytic hyperkeratosis (described above), but the skin changes disappear for short periods, and then recur. The recurrent skin changes can last for weeks or months.

Chromosomal Location

Cytogenetic Location: 17q21.2, which is the long (q) arm of chromosome 17 at position 21.2

Molecular Location: base pairs 40,818,117 to 40,822,621 on chromosome 17 (Homo sapiens Annotation Release 109, GRCh38.p12) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- CK-10
- CK10
- cytokeratin 10
- K1C10_HUMAN

- K10
- keratin-10
- keratin 10, type I
- keratin, type I cytoskeletal 10

Additional Information & Resources

Educational Resources

- Human Intermediate Filament Database
  http://www.interfil.org/details.php?id=NM_000421
- Molecular Cell Biology (fourth edition, 2000): Intermediate Filaments
  https://www.ncbi.nlm.nih.gov/books/NBK21560/

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28KRT10%5BTIAB%5D%29+OR+%28keratin+10%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- ICHTHYOSIS, CYCLIC, WITH EPIDERMOLYTIC HYPERKERATOSIS
  http://omim.org/entry/607602
- KERATIN 10, TYPE I
  http://omim.org/entry/148080

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_KRT10.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=KRT10%5Bgene%5D
- HGNC Gene Symbol Report
  https://www.genenames.org/data/gene-symbol-report/#!/hgnc_id/HGNC:6413
- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:3858
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/3858
- UniProt
  https://www.uniprot.org/uniprot/P13645

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