TEK Gene

Subjects: Genetics & Heredity
Contributor: Rui Liu

TEK receptor tyrosine kinase: The TEK gene (also called the TIE2 gene) provides instructions for making a protein called TEK receptor tyrosine kinase.

genes

1. Normal Function

The *TEK* gene (also called the *TIE2* gene) provides instructions for making a protein called TEK receptor tyrosine kinase. The TEK receptor tyrosine kinase (or TEK receptor) is active (expressed) mainly in endothelial cells, which line the walls of blood vessels. When the TEK receptor is activated, it triggers a series of chemical signals that facilitates communication between endothelial cells and smooth muscle cells. Layers of smooth muscle cells surround layers of endothelial cells lining the walls of blood vessels. Communication between these two cell types is necessary to direct blood vessel formation (angiogenesis) and ensure the structure and integrity of blood vessels.

The TEK receptor is also found in bone marrow, where it is expressed in blood-forming cells called hematopoietic stem cells. The role of the TEK receptor in hematopoietic stem cells is unknown. Researchers speculate that the TEK receptor aids in hematopoietic stem cell growth and division (proliferation) or cell specialization (differentiation).

2. Health Conditions Related to Genetic Changes

2.1. Multiple cutaneous and mucosal venous malformations

At least eight mutations in the *TEK* gene have been found to cause multiple cutaneous and mucosal venous malformations (also known as VMCM). These mutations change single protein building blocks (amino acids) in the TEK receptor tyrosine kinase. The most common mutation replaces the amino acid arginine with the amino acid tryptophan at position 849 in the TEK receptor (written as Arg849Trp or R849W). The R849W mutation and most of the others that cause this condition result in a TEK receptor that is always turned on (overactive).

An overactive TEK receptor is thought to disrupt the communication between endothelial cells and smooth muscle cells. It is unclear how a lack of communication between these cells causes venous malformations. These abnormal blood vessels show a deficiency of smooth muscle cells while endothelial cells are maintained. Venous

malformations cause lesions below the surface of the skin or mucous membranes, which are characteristic of VMCM.

3. Other Names for This Gene

- CD202B
- soluble TIE2 variant 1
- soluble TIE2 variant 2
- TEK tyrosine kinase, endothelial
- TEK tyrosine kinase, endothelial precursor
- TIE-2
- TIE2

References

1. Brouillard P, Vikkula M. Genetic causes of vascular malformations. Hum MolGenet. 2007 Oct 15;16 Spec No. 2:R140-9.
2. Eklund L, Olsen BR. Tie receptors and their angiopoietin ligands arecontext-dependent regulators of vascular remodeling. Exp Cell Res. 2006 Mar10;312(5):630-41.
3. Limaye N, Boon LM, Vikkula M. From germline towards somatic mutations in thepathophysiology of vascular anomalies. Hum Mol Genet. 2009 Apr 15;18(R1):R65-74. doi: 10.1093/hmg/ddp002. Review.
4. Limaye N, Wouters V, Uebelhoer M, Tuominen M, Wirkkala R, Mulliken JB, Eklund L, Boon LM, Vikkula M. Somatic mutations in angiopoietin receptor gene TEK cause solitary and multiple sporadic venous malformations. Nat Genet. 2009Jan;41(1):118-24. doi: 10.1038/ng.272.
5. Morris PN, Dunmore BJ, Tadros A, Marchuk DA, Darland DC, D'Amore PA, BrindleNP. Functional analysis of a mutant form of the receptor tyrosine kinase Tie2causing venous malformations. J Mol Med (Berl). 2005 Jan;83(1):58-63.
6. Vikkula M, Boon LM, Carraway KL 3rd, Calvert JT, Diamonti AJ, Goumnerov B,Pasyk KA, Marchuk DA, Warman ML, Cantley LC, Mulliken JB, Olsen BR. Vasculardysmorphogenesis caused by an activating mutation in the receptor tyrosine kinaseTIE2. Cell. 1996 Dec 27;87(7):1181-90.