RFXANK Gene

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regulatory factor X associated ankyrin containing protein

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1. Normal Function

The *RFXANK* gene provides instructions for making a protein that primarily helps control the activity (transcription) of genes called major histocompatibility complex (MHC) class II genes. Transcription is the first step in the production of proteins, and RFXANK is critical for the production of specialized immune proteins called MHC class II proteins from these genes.

The RFXANK protein is part of a group of proteins called the regulatory factor X (RFX) complex. This complex attaches to a specific region of DNA involved in the regulation of MHC class II gene activity. RFXANK helps the complex attach to the correct region of DNA. The RFX complex attracts other necessary proteins to this region and helps turn on MHC class II gene transcription, allowing production of MHC class II proteins.

MHC class II proteins are found on the surface of several types of immune cells, including white blood cells (lymphocytes) that are involved in immune reactions. These proteins play an important role in the body's immune response to foreign invaders, such as bacteria, viruses, and fungi. To help the body recognize and fight infections, MHC class II proteins bind to fragments of proteins (peptides) from foreign invaders so that other specialized immune system cells can interact with them. When these immune system cells recognize the peptides as harmful, they trigger the lymphocytes and other immune cells to launch immune responses to get rid of the foreign invaders.

The RFX complex also appears to play a role in the transcription of MHC class I genes, which provide instructions for making immune system proteins called MHC class I proteins. Like MHC class II proteins, MHC class I proteins attach to peptides from foreign invaders and present them to specific immune system cells. These cells then attack the foreign invaders to rid them from the body. While the RFX complex is able to help control MHC class I gene activity, it is not the primary regulator of these genes. Other proteins play a more prominent role in their transcription.

2. Health Conditions Related to Genetic Changes

2.1. Bare lymphocyte syndrome type II

Mutations in the *RFXANK* gene are the most common genetic cause of an immune system disorder known as bare lymphocyte syndrome type II (BLS II). More than 40 mutations in this gene have been identified in affected individuals. BLS II is a type of combined immunodeficiency (CID), in which affected individuals have virtually no immune protection from foreign invaders. Consequently, individuals with BLS II have persistent infections in the respiratory, gastrointestinal, and urinary tracts, which can be life-threatening.

Mutations in the *RFXANK* gene lead to production of an altered protein that likely does not function properly. These changes impair binding of the RFX complex to DNA, which prevents transcription of MHC class II proteins. Consequently, lymphocytes lack any MHC class II proteins on their surface, and the body has difficulty getting rid of bacteria, viruses, and fungi, leading to the persistent infections characteristic of BLS II.

3. Other Names for This Gene

- ANKRA1
- ankyrin repeat family A protein 1

- ankyrin repeat-containing regulatory factor X-associated protein
- F14150_1
- MGC138628
- regulatory factor X subunit B
- RFX-B
- RFX-Bdelta4

References

1. Burd AL, Ingraham RH, Goldrick SE, Kroe RR, Crute JJ, Grygon CA. Assembly ofmajor histocompatibility complex (MHC) class II transcription factors:association and promoter recognition of RFX proteins. Biochemistry. 2004 Oct12;43(40):12750-60.
2. Garvie CW, Boss JM. Assembly of the RFX complex on the MHCII promoter: role ofRFXAP and RFXB in relieving autoinhibition of RFX5. Biochim Biophys Acta. 2008Dec;1779(12):797-804. doi: 10.1016/j.bbagrm.2008.07.012.
3. Gobin SJ, Peijnenburg A, van Eggermond M, van Zutphen M, van den Berg R, vanden Elsen PJ. The RFX complex is crucial for the constitutive and CIITA-mediated transactivation of MHC class I and beta2-microglobulin genes. Immunity. 1998Oct;9(4):531-41.
4. Masternak K, Barras E, Zufferey M, Conrad B, Corthals G, Aebersold R, Sanchez JC, Hochstrasser DF, Mach B, Reith W. A gene encoding a novel RFX-associatedtransactivator is mutated in the majority of MHC class II deficiency patients.Nat Genet. 1998 Nov;20(3):273-7.