BCR gene

BCR activator of RhoGEF and GTPase

Normal Function

The *BCR* gene provides instructions for making a protein whose function is not completely understood. Studies show that the BCR protein may act as a GTPase activating protein (GAP). GAPs turn off (inactivate) proteins called GTPases, which play an important role in chemical signaling within cells. Often referred to as molecular switches, GTPases can be turned on and off. They are turned on (active) when they are attached (bound) to a molecule called GTP and are turned off when they are bound to another molecule called GDP. The BCR protein inactivates a GTPase known as Rac1 by stimulating a reaction that turns the attached GTP into GDP. Through this activity, the BCR protein helps regulate the movement (migration) and function of cells.

The BCR protein can also act as a kinase, which is an enzyme that changes the activity of other proteins by adding a cluster of oxygen and phosphorus atoms (a phosphate group) at specific positions. BCR's kinase activity is likely involved in regulating signaling within cells, although its exact role is unclear.

Health Conditions Related to Genetic Changes

Chronic myeloid leukemia

A genetic rearrangement (translocation) involving the *BCR* gene causes a type of cancer of blood-forming cells called chronic myeloid leukemia. This slow-growing cancer leads to an overproduction of abnormal white blood cells. Common features of the condition include excessive tiredness (fatigue), fever, weight loss, and an enlarged spleen.

The translocation involved in this condition, written as t(9;22), fuses part of the *ABL1* gene from chromosome 9 with part of the *BCR* gene from chromosome 22, creating an abnormal fusion gene called *BCR-ABL1*. The abnormal chromosome 22, containing a piece of chromosome 9 and the *BCR-ABL1* fusion gene, is commonly called the Philadelphia chromosome. The translocation is acquired during a person's lifetime and is present only in the abnormal blood cells. This type of genetic change, called a somatic mutation, is not inherited.

The protein produced from the abnormal fusion gene, called BCR-ABL1, signals for

cells to grow and divide and blocks the self-destruction of cells that are abnormal or unneeded. The BCR-ABL1 protein is always turned on, so growth and division of affected blood cells is uncontrolled, leading to overproduction of the abnormal cells.

The presence of the Philadelphia chromosome provides a target for molecular therapies.

Other cancers

The *BCR-ABL1* fusion gene (described above) is also involved in fast-growing blood cell cancers called acute leukemias. It has been found in 5 percent of children and up to 30 percent of adults with B-cell acute lymphoblastic leukemia and very rarely in acute myeloid leukemia. As in chronic myeloid leukemia, the BCR-ABL1 protein stimulates overproduction of abnormal white blood cells, leading to cancer. It is likely that the form of blood cancer that develops is influenced by the type of blood cell that acquires the mutation and other genetic changes that occur.

Other Names for This Gene

- ALL
- BCR/FGFR1 chimera protein
- BCR1
- breakpoint cluster region
- breakpoint cluster region protein isoform 1
- breakpoint cluster region protein isoform 2
- CML
- D22S11
- D22S662
- FGFR1/BCR chimera protein
- PHL
- renal carcinoma antigen NY-REN-26

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of BCR (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=613[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28BCR%5BTI%5D%29+OR+%28BCR,+RhoGEF+and+GTPase+activating+protein%5BTI%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+360+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- BCR ACTIVATOR OF RhoGEF AND GTPase; BCR (https://omim.org/entry/151410)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/613)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=BCR[gene])

References

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- Chereda B, Melo JV. Natural course and biology of CML. Ann Hematol. 2015Apr;94 Suppl 2:S107-21. doi: 10.1007/s00277-015-2325-z. Epub 2015 Mar 27. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/25814077)
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Genomic Location

The *BCR* gene is found on chromosome 22 (https://medlineplus.gov/genetics/chromosome/22/).

Last updated September 1, 2016