

What is Fanconi anemia group C?

Fanconi anemia group C is an inherited disease characterized by physical abnormalities, bone marrow failure, and increased risk of cancer.¹ Individuals with Fanconi anemia group C have defects in the FANCC protein, which is important in the process of DNA repair. Symptoms associated with Fanconi anemia group C are attributed to the inability to correct normally occurring DNA errors. This leads to abnormal cell death or uncontrolled cell growth, which may cause physical abnormalities and lead to bone marrow failure or cancers.²

What are the symptoms of Fanconi anemia group C and what treatment is available?

Signs and symptoms of Fanconi anemia group C are often seen in infancy, and most individuals are diagnosed within the first decade of life.¹ Symptoms noted at birth or in early childhood may include the following:¹

- Limb abnormalities (mostly thumbs and forearms)
- Short stature
- Skin discoloration, including café-au-lait spots (light brown birth marks) and hypopigmented (lighter colored) areas
- Eye abnormalities (such as small eyes, cataracts, lazy eye)
- Developmental delay
- Kidney abnormalities (including abnormally shaped kidneys)
- Heart defects (both structural and functional problems)
- Gastrointestinal abnormalities (including structural problems)
- Anemia
- Bone marrow failure (typically by age 10, ranges from mild to severe)¹
- Leukemia, or other blood-related cancers
- Solid tumors (head, neck, skin, GI and genital tracts)

There is no cure for Fanconi anemia group C. Treatment for Fanconi anemia group C involves management of the symptoms of the disease, including medications to improve blood cell counts and routine surveillance for bone marrow failure and cancer. Hormones and growth factors are used to stimulate production of red blood cells, platelets, and white blood cells.¹ Hematopoietic stem cell transplantation (HSCT or bone marrow transplantation) may be possible for the blood-related manifestations although increased sensitivity to the medications and radiation make this a complex decision.¹ Additionally, cancer treatment for solid tumors is challenging due to the increased toxicity associated with chemotherapy and radiation.^{1,3} Although HSCT can extend the lifespan of a person with Fanconi anemia group C, most people with the disease die before the age of 30.⁴

How is Fanconi anemia group C inherited?

Fanconi anemia group C is an autosomal recessive disease caused by mutations in the *FANCC* gene.² An individual who inherits one copy of a *FANCC* gene mutation is a carrier and is not expected to be affected with Fanconi anemia group C.¹ Research suggests that female carriers of Fanconi anemia group C gene mutations may have an increased susceptibility to developing breast cancer compared with individuals in the general population. Female carriers are encouraged to discuss this finding with their health care providers.^{3,5} An individual who inherits two *FANCC* mutations, one from each parent, is expected to be affected with Fanconi anemia group C.

If both members of a couple are carriers of a mutation in the Fanconi anemia group C gene, the risk for an affected child is 25% in each pregnancy; therefore, it is especially important that the reproductive partner of a carrier be offered testing.

Who is at risk for Fanconi anemia group C?

Fanconi anemia group C can occur in individuals of all races and ethnicities, but appears to be most common in individuals of Ashkenazi (Eastern European) Jewish ancestry, with a carrier frequency estimated at 1 in 100⁶ and a calculated incidence of 1 in 40,000.

Having a relative who is a carrier or who is affected can increase an individual's risk of being a carrier. Consultation with a genetics health professional may be helpful in determining carrier risk and appropriate testing.

What does a positive test result mean?

If a gene mutation is identified, an individual should speak to a physician or genetics health professional about the implications of the result and appropriate testing for the reproductive partner and at-risk family members.

What does a negative test result mean?

A negative result reduces, but does not eliminate, the possibility that an individual carries a gene mutation. The likelihood of being a carrier is also influenced by family history, medical symptoms, and other relevant test results.

Where can I get more information?

Published Guidelines/Consensus Statements:

Eiler ME, Frohnmayer D, Frohnmayer L, Larsen K, Olsen J, eds. *Fanconi Anemia: Guidelines for Diagnosis and Management*. 3 ed. Eugene, OR: Fanconi Anemia Research Fund, Inc. Available at http://www.fanconi.org/images/uploads/other/Guidelines_for_Diagnosis_and_Management.pdf

Fanconi Anemia Research Fund Inc.: <http://www.fanconi.org/>

Cincinnati Children's: <http://www.cincinnatichildrens.org/health/f/fanconi-anemia/>

Chicago Center for Jewish Genetic Disorders: <https://www.jewishgenetics.org/fanconi-anemia-group-c>

Jewish Genetic Disease Consortium: <http://www.jewishgeneticdiseases.org>

Victor Center for Jewish Genetic Diseases: <http://www.victorcenters.org>

References

1. Alter B and Kupfer G. Fanconi Anemia. *GeneReviews*. Available at <http://www.ncbi.nlm.nih.gov/books/NBK1401/>. Accessed: March 7, 2012.
2. Fanconi anemia. Genetics Home Reference: Available at <http://ghr.nlm.nih.gov/condition/fanconi-anemia>. Accessed: March 7, 2012
3. Fanconi Anemia: Guidelines for Diagnosis and Management. 3 ed. Eugene, OR: Fanconi Anemia Research Fund, Inc. Available at http://www.fanconi.org/images/uploads/other/Guidelines_for_Diagnosis_and_Management.pdf
4. Kutler, D *et al.* A 20-year perspective on the International Fanconi Anemia Registry (IFAR) *Blood* 2003; 101:1249-1256.
5. Berwick, M *et al.* Genetic Heterogeneity among Fanconi Anemia Heterozygotes and Risk of Cancer. *Cancer Res.* 2007; 67: 9591-9596.
6. Scott A *et al.* Experience with Carrier Screening and Prenatal Diagnosis for 16 Ashkenazi Jewish Genetic Diseases. *Hum Mutat* 2010; 31:1240-1250.