

Media Fact Sheet

Fanconi Anaemia (FA) is a rare genetic disorder affecting young children, causing bone marrow failure and a predisposition to gynaecological and head & neck cancers. Whilst the bone marrow failure element can be corrected through bone marrow transplantation from a well-matched donor, there is still no cure for the cancer predisposing condition.

Fanconi Anaemia and its Diagnosis:

Fanconi anaemia (FA), named after Swiss paediatrician Guido Fanconi, is one of the inherited anaemias that leads to bone marrow failure (aplastic anaemia) and a predisposition to head, neck and gynaecological cancers. It is a recessive disorder, i.e. if both parents carry a defect (mutation) in the same FA gene, each of their children has a 25% chance of inheriting the defective gene from both parents. Where this happens, the child will have FA.

While the total number of FA patients is not documented worldwide, scientists estimate that the carrier frequency (carriers are people carrying a defect in an FA gene, whose matching FA gene is normal) for FA in the UK is 1 in 350. The incidence rate, or the likelihood of a child being born with FA, is 2-3 per million in the UK, with an estimated 100 to 150 families affected.

Scientists have now discovered 15 FA genes [A, B, C, D1 (BRCA2), D2, E, F, G, I, J, L, M, N, P and RAD51C]. These genes account for more than 95% of the cases of Fanconi anaemia. Mutations in FA-A, FA-C and FA-G are the most common and account for approximately 85% of the FA patients worldwide. FA-D1, FA-D2, FA-E, FA-F and FA-L account for 10%. FA-B, FA-I, FA-J, FA-M, FA-N, FA-P and RAD51C represent less than 5% of FA patients. Some patients do not appear to have mutations in these 15 genes, so we anticipate that additional FA genes will be discovered in the future.

FA occurs equally in males and females and is found in all ethnic groups. Though considered primarily a blood disease, it may affect all systems of the body. Most patients develop bone marrow failure, necessitating a bone marrow transplant. Many patients eventually develop acute myelogenous leukaemia (AML). Patients who live into adulthood are extremely likely to develop head and neck, gynaecological, and/or gastrointestinal cancer and at a much earlier age (20s, 30s, and 40s) than the general population. Patients who have had a successful bone marrow transplant and, thus, are cured of the blood problem associated with FA still must have regular examinations to watch for signs of cancer. Many patients do not reach adulthood.

Fanconi anaemia patients are usually smaller than average. FA usually reveals itself before children are 12 years old, but in rare cases no symptoms are present until adulthood. Patients may feel extreme fatigue and have frequent infections. Nosebleeds or easy bruising may be a first sign. Blood tests may reveal a low white, red cell or platelet count or other abnormalities. Sometimes myelodysplasia or AML is the first sign of FA.

FA sometimes is evident at birth through a variety of physical defects. These may include any of the following:

- Thumb and arm anomalies: an extra or misshapen or missing thumbs and fingers or an incompletely developed or missing radius (one of the forearm bones).
- Skeletal anomalies of the hips, spine or ribs.
- Kidney problems.
- Skin discolouration (café-au-lait spots); portions of the body may have a suntanned look.
- Small head or eyes.
- Mental retardation or learning disabilities.
- Low birth weight.
- Gastrointestinal difficulties.
- Small reproductive organs in males.
- Defects in tissues separating chambers of the heart.

The definitive test for FA at the present time is a chromosome breakage test: some of the patient's blood cells are treated, in a test tube, with a chemical that crosslinks DNA. Normal cells are able to correct most of the damage and are not severely affected whereas FA cells show marked chromosome breakage. There are two chemicals commonly used for this test: DEB (diepoxybutane) and MMC (mitomycin C). These tests can be performed prenatally on cells from chorionic villi or from the amniotic fluid.

Many cases of FA are not diagnosed at all or are not diagnosed in a timely manner. FA should be suspected and tested for in any infant born with the thumb and arm abnormalities described previously. Anyone developing aplastic anaemia at any age should be tested for FA, even if no other defects are present. Any patient who develops squamous cell carcinoma of the head and neck, gastrointestinal or gynaecological system at an early age and without a history of tobacco or alcohol use, should be tested for FA. Many FA patients show no other abnormalities. It is absolutely essential to test for FA before contemplating bone marrow transplantation for aplastic anaemia or treatment for cancer. FA patients respond extremely poorly to standard chemotherapy and radiation protocols.

(Medical information reprinted with kind permission of the Fanconi Anaemia Research Fund)

The Wider Significance of Fanconi Anaemia

Although FA only affects a small number of people in the UK, the genes concerned, i.e. the 'Fanconi pathway', are of great potential importance for all, as they keep our DNA healthy and preventing cancers. The Fanconi pathway is often responsible for a cancer's resistance to chemotherapy drugs. Knowing how to manipulate the Fanconi pathway is likely to lead to better and more successful treatments for *all* cancers.

The Fanconi Hope Charitable Trust

Three parents of affected children, Thomas Carroll, Richard Kawalek and Bob Dalglish started the Fanconi Hope Charity in 2008, to fund research into this disease, to help engender consistent best practice treatment across the UK by initiating and running an NHS FA Clinical Network and to provide much-needed support to affected families through the provision of information and improved family contact. To this end, more than £130,000 has been raised since the Charity's inception.

The Charity is very fortunate to work under the patronage of **The Duchess of Devonshire**, who takes an active part in Annual Trustee meetings.

Due to the rarity of the disease Fanconi Hope has to reach out internationally, with the US-based Fanconi Anaemia Research Fund (FARF) being our principal partner. FARF provide considerable support and guidance and we are able to use their Scientific Advisory Board for Fanconi Hope-sponsored research projects in the UK.

Although the charity is small and staffed by volunteers in their spare time, Fanconi Hope has been able to make significant progress in a number of areas:

- **Bringing Clinicians Together to Share Best Practice:**
 - The Fanconi Anaemia Clinical Network has been established, within the context of our National Health Service and includes around 30 clinicians across the UK and Ireland.
 - A UK Standards of Care document has been published for the first time by the Clinical Network, now been widely circulated throughout the UK Clinician community.
 - 2 Clinicians conferences and a combined Family and Clinician conference have now been held.
- **Promoting Research:**
 - A Research Network has been set up, linking researchers working in the field of Fanconi Anaemia in the UK.
 - Fanconi Hope has now donated over £60,000 to UK Fanconi Anaemia research projects.
 - Fanconi Hope initiated and co-sponsored an International FA Gene Therapy Working Group Meeting in Nov 2010 aimed at expediting the transition from gene therapy research in Fanconi Anaemia into clinical trials worldwide. This was described by the host, Prof Adrian Thrasher of UCL as "a real platform for the accelerated development of collaborative clinical studies." and a report from the meeting has subsequently been published in Nature.
 - A second meeting co-sponsored by Fanconi Hope, the US-based Fanconi Anaemia Research Fund and the Spanish Centre for Biomedical Network Research on Rare Diseases (CIBERER) is scheduled for October 2011.

- **Bringing Families Together:**

- The website www.fanconihope.org and Facebook site (www.facebook.com/fanconihope) have been established to act as a focus for all activities and to provide the means for sharing information.
- Family Meetings have been held in the grounds of Chatsworth House and at Snibston Discovery Centre
- A Family Network has been established enabling families to make contact with each other

- **The Fanconi Hope Charity and Fundraising Activities:**

- Fanconi Hope was set up and registered in 2008.
- Families, friends and colleagues continue to contribute to the fundraising effort and to date over £130,000 has been raised

- **Raising Awareness**

- Members of Fanconi Hope have been working closely with ITV Researchers to develop the current Emmerdale storyline concerning the diagnosis of one of the characters, Sarah Sugden, with Fanconi Anaemia. The screening of this storyline for many months should have a significant beneficial effect on public awareness and our ability to raise funds
- Fanconi Hope will again be exhibiting at and providing a level of sponsorship for the combined European and British Societies for Gene Therapy Annual Conference in Brighton this October in efforts to persuade researchers to use FA as the candidate disease for their gene therapy research.

How can people help?

Fanconi Hope is currently fundraising for further research and is launching an appeal for £50,000 to create and maintain a UK National Patient Registry, to improve patient care and facilitate research.

Fanconi Hope would appreciate donations and offers to fundraise on our behalf.

Successful bone marrow transplant rely on exact donor matches. We would encourage everyone to become a bone marrow donor or to help arrange bone marrow registration clinics through the Anthony Nolan Trust.

(<http://www.anthonynolan.org>)

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