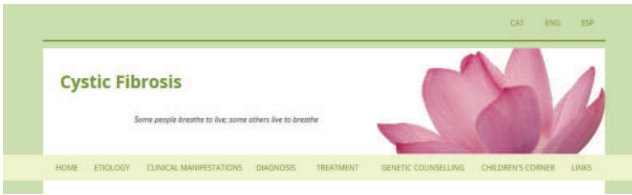


Educational project on Cystic Fibrosis

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Even though Cystic Fibrosis (CF) is the most common autosomal recessive inherited disease in Caucasians, it is still considered an orphan disease. CF relies on a mutation on the CFTR gene that causes an alteration on the CFTR protein. This alteration results in an impaired chloride and water transport across epithelial cells membrane leading to a thick mucus which causes the complications of the disease. There is no cure nowadays for CF.

This project pretends to provide truthful and reliable information about Cystic Fibrosis through the creation of a website. The website was created using the online tool Wix.

<http://rlleuger.wix.com/cystic-fibrosis>

Welcome to this Cystic Fibrosis information site

There are only two days in the year that nothing can be done: the winter holidays and the summer holidays. However, for the rest of the year, you can do something to help your child live better, and you can do it every day. You can do it every day.

When the disease was first recognized as a separate disease, in the 1930s, most children passed away in the first few years of life. Today, thanks to the early diagnosis and the development of the antibiotic treatment, there has been a great improvement in the survival rate and the disease has become a chronic and manageable condition.

The discovery of a mutation in the CFTR gene which encodes for the Cystic Fibrosis Transmembrane Regulator protein (CFTR), found in the epithelial cells, and its change of transport of ions and distribution along the cell membrane. Research of the mutation the process is aimed, leading to a modification of the viscosity, density and elasticity of the mucus that produced at the epithelial surface.

It is a multisystem disease affecting the organs that receive mucus, so it most predominantly affects the lungs and pancreas, but it can also have an effect on the intestines, liver, endocrine system, reproductive organs and sweat glands.

There is not final cure for the disease, but with a proper management of the symptoms there is an improvement on the prognosis.

Introduction

The website was designed in a way that could cover all the different aspects of Cystic Fibrosis.

Therefore, the sections in which it was divided are: introduction, etiology, clinical manifestations, diagnosis, treatment, genetic counselling, children's corner and links.

Moreover, to reach a major audience, all the content is available in three different languages: English, Catalan and Spanish.

The CFTR gene

The DNA is the basis of the hereditary information of an individual and it is stored in chromosomes, which make up the genome. The human genome is composed by 23 pairs of chromosomes, and we can find them in every single nucleated cell of our body. Usually, we get one set of chromosomes from each progenitor. Of these 23 pairs, 22 of them are autosomal and the other pair is the sex that determines the sex of the individual, being XY for men and XX for women.

In chromosome 7 we can find genes, which are basic units of the genetic information. Some of these genes are translated into proteins, so we have two copies of each chromosome, so also two copies of each gene.

In Cystic Fibrosis we will focus on the CFTR gene, which is found on the long arm of the chromosome 7. In the location 16q21.31. Since Cystic Fibrosis is a recessive inherited disease you need both copies of the gene mutated to suffer from the disorder. You can either have two equal mutations on two different copies, as long as you have both genes mutated. Having just one normal gene ensures the production of enough protein to have a normal phenotype, thus people with only one mutation on the CFTR gene will be a carrier of CF but not suffer any symptoms.

The CFTR gene encodes for the Cystic Fibrosis Transmembrane Regulator protein. This protein is a transmembrane protein which forms a channel across the cell membrane to transport of water and Cl ions through it, and also controls other ion channels, it is located in the plasma membrane in normal epithelia.

When a mutation occurs it means that there is a modification of the DNA sequence. There are different types of mutations with different levels of alteration of the gene product going from any consequence in the final product to a totally dysfunctional one.

In CF more than 1500 different mutations have been identified, all of them recessively inherited, being the commonest a three basepair deletion in exon 10 which accounts for about 70% of all. This mutation results in a missing phenylalanine residue in the CFTR protein, ΔF508.

Etiology

Focused on the basis of the disease, this section contains information regarding the defective CFTR gene and protein, and its impact on the chloride and other ions transport through epithelial cell membranes.

Besides, detailed characteristics of the pathophysiology of the different affected systems is provided.



Clinical manifestations

The clinical features of Cystic Fibrosis may vary significantly between patients and another, and may appear from birth to years later.

The symptoms can involve the upper or lower respiratory tract, but usually not all of the features are present by the patient.

The basic symptoms that can be explained in the [introduction](#) are persistent cough and sputum production, recurrent or severe pneumonia and recurrent bronchopulmonary infections, particularly with Pseudomonas aeruginosa, but also with Haemophilus influenzae, Staphylococcus aureus and Klebsiella pneumoniae. There might be energy intolerance due to the accumulation of thick and sticky mucus causing obstruction and air trapping.

Signs of clinical stability may be observed by pulmonary exacerbations triggered by infections, increasing the severity of the symptoms.

It is common for patients with chronic sinusitis and nasal polyps (abnormal growth of nasal tissue).

In terms of [diagnosis](#), the most striking symptom is the fact that the sweat is salty. This feature can be found in almost every patient.

Clinical manifestations

The signs and symptoms of the disease are included in this section, divided by the different systems affected (respiratory system, endocrine and digestive system, skin and reproductive system).

Also, the possible complications arising from Cystic Fibrosis are listed.

Diagnosis

The diagnosis of Cystic Fibrosis is based on the following criteria:

- One or more characteristic clinical features
- All history of cystic fibrosis in a sibling
- CF positive newborn screening test result
- AND
- OR identification of two typical disease mutations
- OR demonstration of an abnormal sweat chloride test result

The characteristic phenotypic features are explained in the [introduction](#) and [clinical manifestations](#).

An affected sibling with Cystic Fibrosis means that both parents are carriers of a mutation in the CFTR gene, so there is a greater chance for a sibling to have the disease than the rest of the population randomly. The genetic pattern and other information of the inheritance of the disease is explained in the [genetic counselling](#).

CF is diagnosed in any child with a history of failure to thrive, asymptotic and recurrent respiratory problems.

The diagnosis tests used are the ones listed below:

- Newborn screening
- Sweat chloride test
- CFTR mutation analysis
- Nasal potential difference test (NPD)
- Prenatal screening

When a Cystic Fibrosis related disorder is detected in a patient, it is indicative that he may suffer from Cystic Fibrosis but has remained undiagnosed until that moment. Then, the tests for CF should be performed.

The diagnosis of the disease, from the identification of the phenotypic features to the individual tests, must be performed by a specialized and experienced physician in an accredited laboratory.

Even though all tests are quite reliable some people with CF may obtain a negative result in one of the tests, this is the reason that more than one test is performed before diagnosing the disease.



Diagnosis

The different diagnostic methods and the corresponding threshold criteria are explained in this section.

- Newborn screening
- Sweat chloride test
- CFTR mutation analysis
- Nasal potential difference test (NPD)
- Prenatal screening

Treatment

Nowadays there is no cure for Cystic Fibrosis.

Nevertheless there is a treatment for this disease. Its aim is to keep a stable clinical status of the patient trying to reduce the symptoms.

The main objectives of CF treatment are: clearance of pulmonary secretions, control of pulmonary infection, pancreatic enzyme replacement, adequate hydration and prevention of respiratory decompensation.

To achieve these objectives, the treatment has three important goals:

- Antibiotic treatment
- Nutritional treatment
- Physiotherapy

Current progress in Cystic Fibrosis treatment

Nowadays there are several new drugs on holding a better treatment for Cystic Fibrosis.

Several studies are achieved every year, all thanks to the economic contribution of Cystic Fibrosis foundations all around the world.

New drugs are being developed, some of them are still in early stages and some others are already available for clinical trials.

For example one of the most important Cystic Fibrosis foundation in the US Cystic Fibrosis Foundation has developed a drug (Pancreatic enzyme) which people can use the drug that are still in development, the ones that are being tested and the ones that are already available for patients (<http://www.cff.org/clinical-trials>). They also have an online resource to find Clinical Trials (<http://www.cff.org/clinical-trials>).

Another example would be the European Cystic Fibrosis Society that has developed a Clinical Trial network to improve and encourage research in drug development for people with Cystic Fibrosis (<http://www.eurocf.eu>).

Treatment

Although nowadays there is no cure for Cystic Fibrosis, a proper management treating the different symptoms helps improving the prognosis. Thus, Cystic Fibrosis treatment has three main parts: antibiotic treatment, physiotherapy and nutritional treatment. All of them are explained in this section and also a short summary of the current studies and progress that is being done at this moment.

Genetic counselling

Cystic Fibrosis and the other CFTR Related Disorders are inherited in an autosomal recessive manner, which means that you need both copies of the gene mutated to suffer from the disorder. This can either mean equal mutations on two different copies, as long as you have both genes mutated. Having just one normal gene ensures the production of enough protein to have a normal phenotype, thus people with only one mutation in the CFTR gene will be a carrier of CF but not suffer any symptoms. Besides, having additional information means that the gene affected is located in a non-sex chromosome. This means that there should be an equal chance between males and female regarding inheritance.

Therefore, the characteristics of an autosomal recessive disorder (and gene) are:

- Both alleles should be affected (recessive)
- Both sexes are equally affected (gender is not involved in the disease)
- On average, half of the offspring of a carrier will be carriers of the affected
- Appears more frequently among offspring of consanguineous marriages

For Cystic Fibrosis, the incidence varies within different regions and ethnic groups being in Caucasians approximately 1 in 2500 individuals, and the lowest being in an ethnically diverse group of the population, namely 23 individuals.

Population	Prevalence	Carrier
European (CF)	1/2500	1/25
African American	1/1600	1/50
Asian	1/3500	1/70
Caucasian (W Europe)	1/2500	1/25
South Africa (White)	1/2500	1/25
Latvian	1/5000	1/50

However, it is very important considering the family background, you can find this through different situations.



Genetic counselling

Genetic counselling can be an important resource for Cystic Fibrosis patients and their families; either for those couples that want to conceive a child or those relatives that may have the disease but have not been diagnosed yet. Therefore, in this section we can find information related to the inheritance of the disease and the risks of having CF.

Children's corner



This is the children's corner, here you can find some educational and funny videos about Cystic Fibrosis.



Children's corner

In order to reach a maximum audience, this section was created to make the information accessible for the little ones. Four animated videos were designed and produced, each one regarding a different aspect of the disease:

- Introduction
- Basic information
- Physical exercise and physiotherapy
- Nutrition and antibiotic treatment

Links of interest

The following links contain further information about Cystic Fibrosis:

- International links

Cystic Fibrosis Foundation - english version
<http://www.cff.org>

Cystic Fibrosis Worldwide - english version
<http://www.cffworldwide.org>

JHMI Hopkins Cystic Fibrosis Center - english version
<http://www.hopkinscf.org>

Cystic Fibrosis Australia - english version
<http://www.cffaustralia.org.au>

Korean Cystic Fibrosis Society - english version
<http://www.cffkorea.org>

Cystic Fibrosis Trust - english version
<http://www.cfftrust.org.uk>

Association Valenciana La Mucoviscidosis - english version
<http://www.valencianacff.org>

Mucoviscidosis - english version
<http://www.mucoviscidosis.org>

Cystic Fibrosis Canada - english version
<http://www.cffcanada.org>

Links

The links' section was created to provide further reliable sources of information to the visitors of this website. The links included are from important international organizations supporting Cystic Fibrosis as well as Spanish and Catalan organizations.

Cystic Fibrosis is a non-curable autosomal recessive inherited disease that may cause respiratory, endocrine, digestive, reproductive and skin complications. This website is aimed at affected people, their friends and relatives so they can learn about the characteristics of the disease. Hence, they can confront the management of the disorder properly and obtain a better prognosis, and therefore, a better lifestyle.