



## Where to Get Help and Information

The CDG Family Network is a non-profit 501 (c)(3) organization.

### Our Mission

- Exchange information about CDG with families and physicians
- Identify individuals with CDG
- raise awareness among the medical community and general public
- Encourage medical research
- The CDG Family network sponsors family conferences, newsletters, a parent contact list, an e-mail list, and a website.



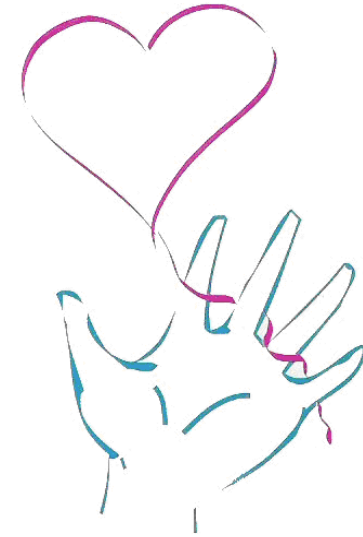
### The CDG Family Network

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Through awareness doctors around the world have begun to recognize symptoms of the different types of CDG.

Your contribution is tax-deductible and will be gratefully acknowledged by The CDG Family Network. Our Federal Tax Identification Number is #02-0491935.

# Congenital Disorders of Glycosylation (CDG)



## The CDG Family Network

"Discovery is seeing what everybody else has seen, and thinking what nobody has thought."

- Albert Szent-Gyorgi

## What is CDG?

Congenital Disorders of Glycosylation (CDG), formerly known as Carbohydrate-deficient glycoprotein syndrome, are a group of disorders caused by the defective synthesis of N-linked oligosaccharides. These oligosaccharides are assembled in a specific order to create different sugar chain patterns on proteins in every cell. Because of the important biologic functions of these oligosaccharides for protein stability and cell communication, incorrect synthesis may result in multi-system involvement.

## Types of CDG

The CDG's are divided into groups I and II based on the location in the biochemical pathway which the defect occurs. Defective genes are lettered in chronological order of their discovery. CDG research is quickly evolving, types are now recognized to include Ia through IL and IIa through IIf. Many are so new that only 1 or 2 patients are known. Scientists are working now to identify other types of CDG.

## What to Expect?

Some children with CDG have serious life-threatening medical problems during their infancy, most stabilize after childhood. Individuals with CDG require expert medical care, sometimes from multiple sub-specialists. Children and adults with CDG have varying degrees of disability, including cognitive impairment, speech difficulties, poor balance and motor skills. As children with CDG- Ia grow older, they exhibit mental retardation, vision problems, seizures, and stroke-like episodes. However, many are conversational with speech impairment and have very charming personalities. Most are wheelchair bound because it is easier and safer for them to get around and they have progressive involvement of their skeleton. Some live at home, some are in assisted living settings.

A growing number of newly diagnosed patients do not present with a classic CDG I profile, & many of them have a significantly milder form of disease.

## Signs and Symptoms

The symptoms and severity of CDG vary from child to child. Some of the symptoms become more prominent at different ages. Today, the clinical spectrum of CDG is expanding with milder and more severe features being recognized, still many cases are often misdiagnosed.

## Children with CDG may have any or all of the following clinical issues:

- hypotonia (low muscle tone)
- failure to thrive (slow growth)
- developmental delay
- hepatopathy (liver disease)
- coagulopathy (low levels of clotting factors)
- hypothyroidism
- esotropia (crossed eyes)
- abnormal fat pattern including increased suprapubic fat pad, skin dimpling and inverted nipples or subcutaneous fat pads having a toughened, puffy, or uneven consistency
- hypoglycemia
- seizures
- cerebellar hypoplasia (changes in the brain that can be seen on MRI)
- stroke-like episodes in a developmentally delayed child

At a later age, in adolescence or adulthood, the presentation may include the following clinical features in addition to a suggestive history:

- Neurologic evidence of cerebellar dysfunction (ataxia, dysarthria, dysmetria)
- absent puberty in females, small testes in males
- retinitis pigmentosa (pigment in the retina of the eye)
- progressive scoliosis (curvature of the spine)
- joint contractures
- peripheral neuropathy with or without muscle wasting

## How is CDG Diagnosed?

Fortunately, most CDG patients can be diagnosed by a simple blood test to analyze the glycosylation status of transferrin (Tf). Abnormal Tf is detected by isoelectric focusing, or by electrospray ionization-mass spectrometry. Once CDG is diagnosed, further testing is required to determine the type of CDG.

## Is Treatment Available?

There is no specific medicine to treat CDG, except for CDG-Ib and some CDG-IIc patients. Current treatment for CDG patients is supportive therapy and treatment of symptoms and sequelae. The effective therapy for CDG-Ib is oral mannose. CDG-Ib presents with protein-losing enteropathy, coagulopathy and liver disease without neurological involvement. These patients have significant gastrointestinal problems, but are neurologically and intellectually normal. Fucose supplements have been used to treat patients with CDG-IIc who have a defective GDP-Fucose transporter. Infections cease and health improves. Unfortunately, fucose does not improve or reverse the developmental delay.

## Prenatal Testing

Many families who have a child with CDG want to know what their risk is of having another child with CDG with another pregnancy. This risk can be assessed by knowing that CDG is a recessively inherited disease. This means that, although each parent carries two genes for the CDG function, one of them doesn't work correctly. The functional single gene in the parent protects them from having CDG. A child with CDG has inherited two of these non-working genes, one from each parent. Usually there is a 1:4 risk of having a second child with CDG-Ia, but recent work shows that the ratio is closer to 1:3. This higher incidence is surprising, and so far, it has only been shown for CDG-Ia. Families are encouraged to contact a genetics consultant. A genetics doctor/counselor can help to explain the genetic risk for each family and the risk in future pregnancies.

## Key U.S. Research Contacts

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