NEWBORN SCREENING FACT SHEET

HCSD or MCD
Holocarboxylase Synthetase Deficiency
Multiple Carboxylase Deficiency – Neonatal (MCD)

What is it?
HCSD stands for holocarboxylase synthetase deficiency. It is one type of organic acid disorder. People with HCSD have problems changing protein and carbohydrates from food into energy for the body.

What causes it?
HCSD occurs when an enzyme, called holocarboxylase synthetase (HCS), is either missing or not working properly. This enzyme’s job is to add a vitamin called biotin to other enzymes called carboxylases so that they can change the food we eat into energy for the body. When the HCS enzyme is not working, certain harmful substances build up in the blood and urine. This can cause serious health problems.

If HCSD is not treated, what problems occur?
Each child with HCSD is likely to have slightly different effects. Many babies with this condition start to have symptoms within hours of birth or during the first few days or weeks of life. Other babies have their first symptoms sometime in infancy, usually before age 2.

A small number of people with HCSD never show symptoms and are found to be affected only after a brother or sister is diagnosed.

HCSD causes episodes of illness called metabolic crises. Some of the first symptoms of a metabolic crisis are:

1) Poor appetite.
2) Extreme sleepiness or lack of energy.
3) Irritability.
4) Vomiting.
5) Low muscle tone (floppy muscles and joints).
6) Severe peeling skin rash.

Common lab findings are:
1) Low blood sugar, called hypoglycemia.
2) High levels of acidic substances in the blood, called metabolic acidosis.
3) Slightly high levels of ammonia in the blood.
4) Low platelets.
5) Ketones in the urine.
6) High levels of substances called organic acids in the urine.

If a metabolic crisis is not treated, a child with HCSD can develop:
1) Breathing problems.
2) Seizures.
3) Swelling of the brain.
4) Coma, sometimes leading to death.

Untreated children with HCSD often have other symptoms, whether or not they have metabolic crises. These can include:
1) Skin rashes or skin infections.
2) Hair loss.
3) Learning disabilities or mental retardation.
4) Delays in walking and motor skills.
5) Problems coordinating movements, called ataxia.
6) Rigid muscle tone, called spasticity.
7) Problems coordinating movements, called ataxia.
8) Rigid muscle tone, called spasticity.
9) Poor growth.
10) Seizures.
11) Hearing loss.
12) Vision loss.

Without treatment, brain damage can occur. This can result in mental retardation. If left untreated, many babies with HCSD die.

What is the treatment for HCSD?
Your baby’s primary doctor will work with a metabolic doctor to provide care for your child.

The main treatment for HCSD is a type of B vitamin called biotin. In babies found to have HCSD through newborn screening, biotin treatment can prevent symptoms from occurring. It can also reverse some of the health problems in children who already have shown symptoms. You will need a prescription from your doctor in order to purchase the amount of biotin your child will need.

Prompt treatment with biotin is needed to prevent mental retardation and serious medical problems. You should start the treatment as soon as you know your child has HCSD. Your child will need to take biotin by mouth on a daily basis throughout life.

Biotin is usually the only medication needed to treat HCSD. Your child will not need to restrict any activities or change his or her diet.

What happens when HCSD is treated?
Babies who receive prompt and ongoing treatment with biotin before they have a metabolic crisis are expected to have normal growth and development.

Even with treatment, a few children have developed lifelong learning problems or mental retardation. In children who have already shown delays in learning or loss of hearing or eyesight treatment can prevent additional effects. But, it may not be able to correct the effects that are already present.

What causes the HCS enzyme to be absent or not working correctly?
Genes tell the body to make various enzymes. People with HCSD have a pair of genes that do not work correctly. Because of these gene changes, the HCS enzyme does not work properly or is not made at all.

Is HCSD inherited?
HCSD is inherited and affects both boys and girls equally.

Everyone has a pair of genes that make the HCS enzyme. In children with HCSD, neither of these genes works correctly. These children inherit one nonworking gene for the condition from each parent.

Parents of children with HCSD rarely have the disorder. Instead, each parent has a single non-working gene for HCSD. They are called carriers. Carriers do not have HCSD because the other gene of this pair is working correctly.

When both parents are carriers, there is a 25 percent chance in each pregnancy for the child to have HCSD. There is a 50 percent chance for the child to be a carrier, just like the parents. And, there is a 25 percent chance for the child to have two working genes.

Can other members of the family have HCSD or be carriers?

Having HCSD

The brothers and sisters of a baby with HCSD have a small chance of being affected, even if they haven’t had symptoms. Finding out whether other children in the family have this condition is important because early treatment may prevent serious health problems. Talk with your metabolic doctor or genetic counselor about testing your other children.
**HCSD Carriers**

Brothers and sisters who do not have HCSD still have a chance to be carriers like their parents. Except in special cases, carrier testing should be done only in people older than 18.

Each of the parents’ brothers and sisters has a 50 percent chance to be an HCSD carrier. It is important for other family members to be told that they could be carriers. There is a small chance they are also at risk to have children with HCSD.

When both parents are HCSD carriers, newborn screening results are not sufficient to rule out the condition in a newborn baby. In this case, special diagnostic testing should be done in addition to newborn screening.

**Can other family members be tested?**

**Diagnostic Testing**

Diagnostic testing on blood or skin samples can be done for brothers or sisters of a child with HCSD. Talk to your doctor or genetic counselor if you have questions about testing for HCSD.

**Carrier Testing**

Carrier testing for HCSD may be available. If you have questions about carrier testing, ask your genetic counselor or metabolic doctor.

**How many people have HCSD?**

About one in 87,000 babies in the United States is born with HCSD.

**Does HCSD happen more frequently in a certain ethnic group?**

No, HCSD does not happen more often in any specific race, ethnic group, geographical area or country.

**Does HCSD go by any other names?**

HCSD is sometimes also called:

1) Holocarboxylase deficiency.
2) HLCS deficiency.
3) Multiple carboxylase deficiency, early-onset.
4) Infant multiple carboxylase deficiency.
5) MCD, neonatal form.

**Where can I find more information?**

Organic Acidemia Association
www.oaanews.org

Children Living with Inherited Metabolic Diseases (CLIMB)
www.climb.org.uk

Save Babies Through Screening Foundation
www.savebabies.org

Genetic Alliance
www.geneticalliance.org

**Children’s Special Health Services (CSHS)**

State Capitol Judicial Wing
600 E. Boulevard Ave., Department 301
Bismarck, ND 58505-0269
Toll Free: 800.755.2714
701.328.2436
Relay TDD: 701.328.3975
CSHS website: www.ndhealth.gov/CSHS
North Dakota Department of Health website: www.ndhealth.gov

Family support resources available from CSHS:
- Guidelines of Care Info
- Family Support Packet
- Financial Help Packet
- Insurance Fact Sheet

**Family Resources**

Family to Family Network
Center for Rural Health
University of North Dakota
School of Medicine and Health Sciences
P.O. Box 9037
Grand Forks, ND 58202-9037
Toll Free: 888.434.7436
701.777.2359
Fax: 701.777.2353
E-mail: NDF2F@medicine.nodak.edu
www.medicine.nodak.edu/crh
**This fact sheet has general information. Every child is different and some of these facts may not apply to your child specifically. Certain treatments may be recommended for some children but not others. All children should be followed by a metabolic doctor in addition to their primary-care provider.**

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