Primary Congenital Hypothyroidism

Primary congenital hypothyroidism (CH) occurs when infants are unable to produce sufficient amounts of thyroid hormone (thyroxine, or T4), which is necessary for normal metabolism, growth, and brain development. The thyroid's job is to make thyroid hormone, which is secreted into the blood and then carried to every tissue in the body. Left untreated, this congenital deficiency of thyroid hormone can result in mental retardation and stunted growth. Affected newborns may appear normal up to three months of age. If detected early and maintained on treatment (hormone replacement medication), infants with CH should have normal growth and development.

Clinical Symptoms: Although the clinical signs of hypothyroidism may be subtle, infants with CH may exhibit some of the following symptoms: feeding problems, lethargy, prolonged postnatal jaundice, delayed stooling and constipation, enlarged protruding tongue, hoarse cry, protruding abdomen with an umbilical hernia, cold mottled skin, sluggish reflexes, patent posterior fontanelle with widely spread cranial sutures, or delayed skeletal maturation for gestational age.

Prevalence: 1:3000 in Missouri.

Analyte Measured: Thyrotropin (TSH - Thyroid Stimulating Hormone).

Feeding Effect: None

Timing Effect: < 24 hours of age: results are not valid, repeat newborn screen.

≥ 24 hours of age: results are valid

Reporting Ranges:

All specimens collected before 24 hours of age are given a **"No Result"** and a repeat newborn screen is requested.

Age (hrs) of Infant	0 – 24 ulU/mL	25 - 49 ulU/mL	50 or greater ulU/mL
< 24	"No Result"	"No Result"	* "No Result" (60 ulU/mL or greater)
> 24	Normal	Borderline Risk	High Risk

*Any results that are collected at less than 24 hours of age and in the high risk range are brought to the attention of the supervisor for review. If a repeat newborn

screen is not received in a timely manner, a call will be made to the baby's primary care physician indicating need for a repeat newborn screen.

Reporting Results:

Normal: Final newborn screening reports are mailed to the submitter and physician of record.

Borderline Risk: Final newborn screening reports are mailed to the submitter and physician of record.

High Risk: Final results are phoned and faxed to physician/health care provider and appropriate follow up center. Follow up centers are contracted by the Department of Health and Senior Services for follow up tracking, testing, diagnosis, and counseling. Final newborn screening report is mailed to the submitter and physician of record.

Interpretation of Newborn Screening Results:

Screen Results	Probable Cause	Actions	Follow Up
TSH HIGH RISK	- Primary Hypothyroidism - Maternal Antibodies - Medications(PTU) - False Positive (TSH surge, other illness, prematurity)	Newborn Screening Lab will phone/fax physician/health care provider and follow up center with abnormal results.	Diagnostic thyroid serum testing & consult with pediatric endocrinologist recommended.
TSH BORDERLINE RISK**	- False Positive (TSH surge, other illness, prematurity) - Possible hypothyroidism - Maternal antibodies or medication	Final results mailed to physician of record and submitter.	Repeat newborn screen, or do serum testing.

* * Repeat Borderline Risk TSH results should be followed up with diagnostic serum testing.

Types of Primary Congenital Hypothyroidism: There are several types of primary CH, the most common form resulting from abnormal fetal development of the thyroid gland. The thyroid gland may be absent, mislocated (ectopic) or malformed. Transient hypothyroidism may occur in some infants as a result of maternal exposure to excess iodine, anti-thyroid medication (propylthiouracil or PTU), or exposure of the infant to maternal anti-thyroid antibodies. The use of iodine-based skin disinfectants on neonates, especially premature neonates, can inhibit thyroxine production resulting in transient hypothyroidism.

Treatment: Treatment of CH is relatively simple and very effective. Immediate diagnosis and treatment of CH in the neonatal period is critical for normal brain development and physical growth. Treatment is usually effective if started within the

first few weeks of life. Delayed treatment may result in decreased intellectual capacity. Recommended treatment is lifetime daily administration of thyroxine. Dose is weight dependent, therefore, consultation with a pediatric endocrinologist is recommended. The dosage of medication must be adjusted and monitored as the child grows.

Special Considerations: Premature, low birth weight, sick NICU infants have been documented to develop a late onset form of CH. Therefore, it is recommended that if the first specimen is collected at 24-48 hours of age, then a second screen be done at 10-14 days of age or at discharge if sooner. **All abnormal results need to be investigated by further testing**.

False Positive/Negative: Specimen collection prior to 24 hours of age, prematurity, and illness can all affect the newborn screening results.

- False positives may occur due to early specimen collection. In the first day of life, TSH levels may be transiently elevated. In normal cases this level will resolve after the first 24 hours. TSH increases dramatically shortly after birth and gradually returns to adult normal levels in about 72 hours. False positive results occur due to the specimen being collected at the height of the TSH spike, usually within the first 24 hours of life. For this reason "no result" is reported on those specimens collected before 24 hours of age. TSH levels should begin to return to normal levels within 24 – 48 hours following birth. Other factors that can affect thyroid hormone levels and result in abnormal screening results are prematurity, maternal medication, such as anti-thyroid drugs, or topical iodine treatment.

- The **false-negative** rate for CH on the first newborn screening specimen is higher than all of the other disorders screened. **Therefore, even if the newborn screening results are normal, the physician must remain alert to clinical symptoms in older infants and/or a family history of thyroid disorders. Perform diagnostic thyroid serum testing if any doubt exists.**

Comment: Although newborn screening can detect "primary" hypothyroidism with a high degree of accuracy, delayed hypothyroidism and other forms of hypothyroidism may develop in the weeks after birth.