

# BabyNet Covered Diagnoses Fact Sheets

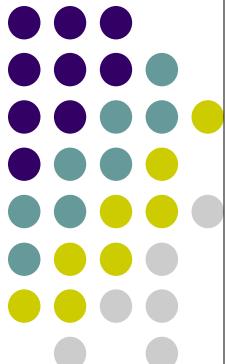
## Points of Interest:

- Summaries of Conditions
- Diagnosing Conditions
- Causes, Signs, and Symptoms
- Treatments
- Prognoses

# Introduction

This document was produced by Team for Early Childhood Solutions (TECS) at the University of South Carolina (USC), Center for Disability Resources. The purpose of this document is to offer information on specific diagnoses listed in [Appendix 3: Covered Diagnoses](#) of the BabyNet Policy and Procedure Manual.

Additional contributors in the development of this document included DHEC, South Carolina's Part C Early Intervention Agencies, and Family Special Interest Groups. This document has been created using various online disabilities databases. For specific references and more information, please visit the link at the bottom of each page. This document is for use in South Carolina's BabyNet System.



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# 10p13 Deletion (DiGeorge Syndrome)

## Summary:

A developmental defect of derivatives of the third and fourth pharyngeal pouches, almost always associated with agenesis or hypoplasia of the thymus and parathyroid gland, characteristic facies with downslanting palpebral fissures and ocular and nasal anomalies, hypocalcemia, cardiovascular anomalies, immunodeficiency, and other variable abnormalities. Patients who survive infancy are usually mentally retarded. DiGeorge syndrome is considered by some researchers as a developmental field defect consisting of several casually distinct disorders, rather than a distinct syndromic entity. Conditions associated with the development of DiGeorge syndrome include diabetic embryopathy, fetal alcohol syndrome, and Zellweger syndrome. Major features of this syndrome have been designated by the Newcastle Upon Tyne Group CATCH 22 (Cardiac, Abnormal facies, Thymic hypoplasia, Cleft palate, and Hypocalcemia), the number 22 indicating deletion of the long arm of chromosome 22 (22q11).

DiGeorge syndrome (DGS) comprises hypocalcemia arising from parathyroid hypoplasia, thymic hypoplasia, and outflow tract defects of the heart. Disturbance of cervical neural crest migration into the derivatives of the pharyngeal arches and pouches can account for the phenotype. Most cases result from a deletion of chromosome 22q11.2 (the DiGeorge syndrome chromosome region, or DGCR). Several genes are lost including the putative transcription factor TUPLE1 which is expressed in the appropriate distribution. This deletion may present with a variety of phenotypes: Shprintzen, or velocardiofacial syndrome (VCFS; [192430](#)); conotruncal anomaly face (or Takao syndrome); and isolated outflow tract defects of the heart including tetralogy of Fallot, truncus arteriosus, and interrupted aortic arch. A collective acronym CATCH22 has been proposed for these differing presentations. A small number of cases of DGS have defects in other chromosomes, notably **10p13**. In the mouse, a transgenic Hox A3 (Hox 1.5) knockout produces a phenotype similar to DGS as do the teratogens retinoic acid and alcohol.

**Head and neck:** Micrognathia.

**Ears:** Low-set small posteriorly rotated ears that are sometimes pointed and middle ear abnormalities.

**Eyes:** Hypertelorism and downslanting palpebral fissures.

**Nose:** Choanal atresia, blunted nose with a broad bridge, anteverted nostrils, clefting or indentations, and short philtrum.

**Mouth and oral structures:** U-shaped mouth, cleft palate, bifid uvula, and highly arched palate.

**Nervous system:** Holoprosencephaly, meningocele, hydrocephalus, and neural crest disturbance.

**Cardiovascular system:** Truncus arteriosus, atrial septal defect, ventricular septal defect, aortic arch abnormalities, teratology of Fallot, and pulmonary valve atresia.

**Gastrointestinal system:** Esophageal atresia, tracheoesophageal fistula, Meckel diverticulum, imperforate anus, and intestinal malrotation.

**Urogenital system:** Ureterohydronephrosis and renal cystic dysplasia.

**Endocrine system:** Agenesis or hypoplasia of thymus and parathyroid gland.

**Immunologic system:** Immunodeficiency and frequent infections, including pneumonia.

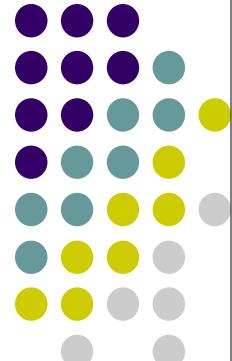
**Biochemical and metabolic features:** Hypocalcemia.

**Temporal features:** Most infants die within the first few months of life.

**Growth and development:** Mental retardation.

**Behavior and performance:** Speech disorders.

**Heredity:** Many cases are sporadic but a few are genetically inherited which are transmitted as autosomal recessive, autosomal dominant, and X-linked traits. Listed in OMIM in the autosomal dominant catalog. Chromosomal abnormalities linked to DiGeorge syndrome include {dup(1q}, {del(5p)}, {dup(8q)}, **del(10p)}**, {del(17p)}, del(22q11)}.



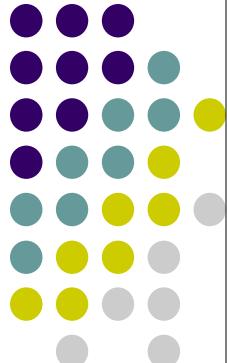
# 11q Deletion

## (Jacobsen Syndrome)

### Summary:

Jacobsen syndrome is a rare **chromosome** disorder that affects multiple aspects of physical and mental development.

Jacobsen syndrome is characterized by a distinctive facial appearance, some degree of mental impairment, and certain types of birth defects, especially of the heart. Other common medical complications include recurrent infections, decreased platelet count, failure to thrive, and slow growth. The syndrome derives its name from a Danish physician, Dr. Petra Jacobsen, who first described an affected child in 1973. It is also known as 11q deletion syndrome or partial 11q monosomy syndrome because a specific region of one copy of chromosome 11 is missing and thus an affected person has one out of a possible two copies of the genes in that region. It is the loss of these genes that leads to the multiple problems found in Jacobsen syndrome.



### Diagnosis:

Most individuals with Jacobsen syndrome are diagnosed after birth. The diagnosis is usually made through a blood test called chromosome analysis in an infant or child who has mental retardation and a typical facial appearance. The **karyotype** will show a deletion or rearrangement of the longer segment, known as the q arm, of one copy of chromosome 11. Jacobsen syndrome can be diagnosed before birth. There have been reports of prenatal diagnosis through **amniocentesis** after an ultrasound demonstrated one or more fetal abnormalities. Another technique, known as FISH (fluorescent in-situ hybridization), may be used to further define the chromosome 11q deletion breakpoints; this laboratory test is being done on a research basis to identify the disease-causing genes in the Jacobsen syndrome critical region.

### Symptoms:

Symptoms of Jacobsen syndrome are variable and the prognosis for an affected child depends on the presence of life-threatening birth defects or medical problems. Individuals with Jacobsen syndrome have a distinctive physical appearance. The face is characterized by wide-spaced eyes (hypertelorism), droopy eyelids (ptosis), redundant skin covering the inner eye (epicanthal folds), a broad or flat nasal bridge, a short nose with upturned nostrils, a small chin (micrognathia), low-set ears, and a thin upper lip. As many as 90–95% of affected individuals have a malformation of the skull, trigonocephaly, a defect that results from premature closure of one of the cranial sutures. A small head size (microcephaly) is found in over one-third of cases. Overall, individuals with Jacobsen syndrome are smaller than their peers or siblings. Prenatal growth retardation occurs about 75% of the time. A newborn with Jacobsen syndrome is usually small at birth and continues to have delayed growth and subsequent short stature. Feeding problems that can result in failure to thrive are also common.

### Treatment:

There is no cure for Jacobsen syndrome nor is there a therapy that can replace the missing genes from the deleted segment of chromosome 11. In addition to routine pediatric exams, there are management strategies and treatments that aim to prevent or minimize some of the serious health consequences associated with Jacobsen syndrome.

At the time of diagnosis a series of evaluations should be undertaken in order to appropriately guide medical management. Pediatric specialists in genetics, cardiology, orthopedics, ophthalmology, and neurology should be consulted, especially since some problems can be treated if caught early. Important tests may include a karyotype, a cardiac echocardiogram, a renal sonogram, a platelet count, a blood count, a brain imaging study, hearing and vision screenings, and a dental exam.

### Prognosis:

Approximately 25% of affected children die before two years of age mainly from cardiac defects, a tendency to bleed, or infection. Except for respiratory infections, the remainder of children are generally healthy. Most individuals described here are children or adolescents. Little is known about the course of this syndrome in adulthood, and the life expectancy for those who live beyond age two is unknown.

# 13q Syndrome (Orbeli Syndrome)

**Summary:** Deletion of the long arm of chromosome 13 with a wide spectrum of abnormalities, including retinoblastoma, mental and growth retardation, brain malformations, heart defects, distal limb deformities, and digestive, urogenital, and other abnormalities. Deletions limited to proximal bands (q13-q31) are marked mainly by growth retardation but no major deformities, those involving band 32q are usually associated with numerous major malformations, and distal deletions are usually complicated by severe mental retardation with comparatively minor abnormalities. Garcia-Lurie syndrome and this disorder share many common clinical features.

**Head and neck:** Microcephaly and mandibular cleft.

**Ears:** Malformed ears.

**Eyes:** Microphthalmos, hypertelorism, colobomata, retinoblastoma, and aniridia.

**Mouth and oral structures:** Cleft palate and highly arched palate.

**Hand and foot:** Absent or hypoplastic thumbs and big toes, fused toes, talipes calcaneovalgus, fusion of metacarpal bones, brachydactyly, syndactyly, and clubfoot.

**Spine:** Abnormal vertebrae.

**Muscles:** Hypotonia.

**Nervous system:** Hypoplasia or aplasia of corpus callosum and forebrain, anencephaly, hydrocephaly, aplasia of the olfactory tracts, hypoplasia of the optic nerve, and encephalocele.

**Cardiovascular system:** Atrial septal defect, ventricular septal defect, tetralogy of Fallot, patent ductus arteriosus, coarctation of the aorta, situs inversus, and common aortopulmonary trunk.

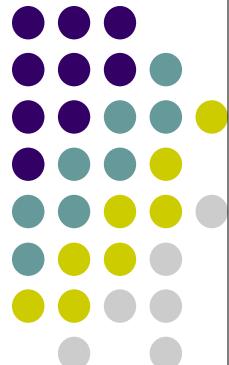
**Gastrointestinal system:** Duodenal atresia, Hirschprung disease (megacolon due to absence of neural plexuses), intestinal malrotation, imperforate anus, and aplasia of the small intestine. Transposition.

**Urogenital system:** Hypoplastic kidneys, dilated collecting system, hydronephrosis, ambiguous genitalia, absent uterus, and penoscrotal transposition.

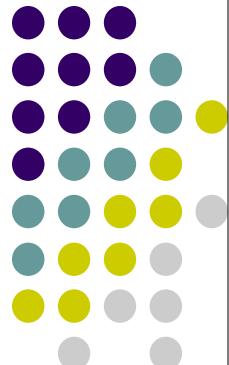
**Hematopoietic system:** Blood coagulation factors VII and X deficiency.

**Growth and development:** Growth and mental retardation.

**Behavior and performance:** Blindness and deafness.



# 18q Deletion Syndrome



**Summary:** Deletion of the long arm of chromosome 18 with a phenotype that may vary considerably, depending on the type of deletion and location of the breakpoint. The syndrome is marked mainly by mental retardation, midface hypoplasia, deeply set eyes, carp mouth, mild obesity, ataxia, hypotonia, malformed ears, and hyperactive and aggressive behavior. Neoplastic diseases may occur.

**Head and neck:** Microcephaly, brachycephaly, dolichocephaly, high forehead, retrognathia or prognathism, and midfacial hypoplasia.

**Ears:** Narrow ear canals, small ears, overfolded helices, and prominent antihelices.

**Eyes:** Strabismus, nystagmus, deeply set eyes, downward or upward slant of palpebral fissures, blepharoptosis, and hypertelorism or hypotelorism.

**Nose:** Short nose with flat and broad bridge, wide and flat philtrum, and epicanthal folds.

**Mouth and oral structures:** Carp mouth, downturned corners of the mouth, highly arched or cleft palate, and malformed teeth.

**Thorax:** Pectus excavatum and widely spaced nipples

**Hand and foot:** Tapered fingers, proximal thumbs, clinodactyly, abnormal toes, and clubfoot. Dermatoglyphic findings consist of increased whorls on fingers and transverse palmar creases.

**Muscles:** Hypotonia.

**Nervous system:** Polymicrogyria, brisk deep tendon reflexes and seizures. Neurofibrillary tangles have been observed in some cases.

**Cardiovascular system:** Malformations of pulmonary and oblique innominate veins.

**Respiratory system:** Pulmonary and bronchial anomalies.

**Urogenital system:** Hypoplastic labia and scrotum, small penis, fibrotic testes, and cryptorchidism.

**Endocrine system:** Growth hormone deficiency.

**Immunologic system:** Immunoglobulin A (IgA) deficiency.

**Growth and development:** Growth, speech, and mental retardation.

**Behavior and performance:** Ataxia, poor coordination, awkward gait, and deafness. Autistic behavior and aggressiveness.

# 49XXXXy Syndrome

**Summary:** A sex chromosome aneuploidy with an incidence of 1 in 85,000 male births. Principal findings include radioulnar synostosis, hypogonadism, mental retardation, and speech disorders. Associated disorders are variable and may include characteristic facies, multiple skeletal abnormalities, and cardiac and genital malformations. Many features are similar to those seen in the Klinefelter syndrome (chromosome XXY syndrome), hence the synonym Klinefelter variant.

**Head and neck:** Hemifacial microsomia, prominent forehead, malar flattening, maxillary prognathism, mandibular retrognathia, plagiocephaly, open metopic sutures, and facial asymmetry.

**Ears:** Narrow ears and preauricular pits.

**Eyes:** Upplanting palpebral fissures, blepharoptosis, underdeveloped orbits, strabismus, and telecanthus.

**Nose:** Broad and flat nose, depressed bridge,

**Mouth and oral structures:** Horizontal palpebral fissures and downturned corners of the mouth.

**Neck:** Cervical rib and short neck.

**Thorax:** Asymmetric chest and inverted nipples.

**Abdomen:** Inguinal hernia.

**Hand and foot:** Clinodactyly, hypoplastic distal phalanges of each finger, increased gaps between 1st and 2nd toes, and hypoplastic thenar eminences. Dermatoglyphic findings consist of converging creases on the 5th fingers, prominent plantar creases, and hypoplastic distal flexion creases of thumbs and fingers with bridged simian creases.

**Extremities:** Radioulnar synostosis, hyperextensible elbows, genu valgum, and hip subluxation.

**Spine:** Scoliosis.

**Muscles:** Hypotonia.

**Bones and joints:** Delayed ossification and epiphyseal dysplasia.

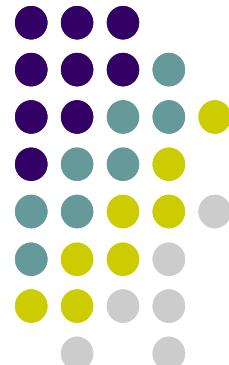
**Skin:** Hyperkeratosis.

**Skin appendages:** Low anterior hairline. Clubbing of finger and toenails.

**Cardiovascular system:** Atrial and ventricular septal defects, patent ductus arteriosus, and cardiomegaly.

**Urogenital system:** Hypogonadism, hypoplastic foreskin, scrotalization of the penis, small testes, and hydrocele.

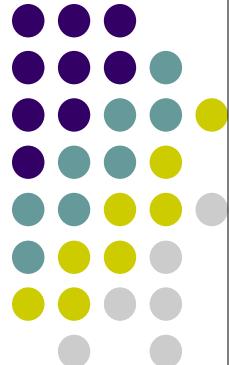
**Growth and development:** Mental, growth, motor, and speech retardation.



# 6p Minus Syndrome

## Synonyms

6p- syndrome  
6p deletion syndrome  
chromosome 6p monosomy  
del(6p) syndrome  
deletion 6p syndrome  
partial monosomy s6p



## Summary

Deletion of the short arm of chromosome 6 with variable abnormalities, including mental retardation, microcephaly, abnormal cranial sutures, broad nasal bridge, ear and eye anomalies, short neck, pectus excavatum, Poland anomaly (absence of the pectoralis major muscle of its sternal portion associated with ipsilateral shortening of the phalanges with syndactyly), deafness, congenital heart defects, and highly arched palate.

## Major Features

**Head and neck:** Microcephaly and abnormal cranial sutures.

**Ears:** Low-set malformed ears.

**Eyes:** Hypertelorism, telecanthus, strabismus, excentric pupils, iris hypoplasia, anterior synechiae, Rieger anomaly, downslanting palpebral fissures, anterior chamber abnormalities.

**Nose:** Broad bridge, choanal narrowing, and short and smooth philtrum.

**Mouth and oral structures:** Tented mouth, downturned mouth, highly arched palate, dental caries, and cleft lip and uvula.

**Neck:** Short neck and redundant nuchal skin.

**Thorax:** Absent pectoralis major muscle and pectus excavatum.

**Abdomen:** Umbilical and inguinal hernia.

**Hand and foot:** Short phalanges and syndactyly. Dermatoglyphic findings consist of single palmar creases.

**Muscles:** Hypotonia.

**Skin:** Eczema.

**Nervous system:** Hydrocephalus.

**Cardiovascular system:** Systolic murmur, supravalvular tachycardia, and bicuspid insufficiency.

**Urogenital system:** Cryptorchidism and hypogonadism. Abnormalities.

**Growth and development:** Growth, motor, speech, and mental retardation.

**Behavior and performance:** Deafness and failure to thrive.

# 6q Minus Syndrome

**Summary:** Deletion of the long arm of chromosome 6 with delayed mental development and variable multiple abnormalities, mainly microcephaly, orofacial anomalies, short neck, cardiovascular defects, abnormal dermatoglyphics, hand deformities, and other defects.

**Head and neck:** Microcephaly, brachycephaly, dolichocephaly, round coarse face, facial asymmetry, and micrognathia.

**Ears:** Large low-set dysmorphic ears and preauricular pits and tags.

**Eyes:** Uplanting or upslanting short and narrow palpebral fissures, microphthalmia, hypertelorism, strabismus, blue sclera, retinal abnormalities, cataract, deeply set eyes, and tear duct atresia.

**Nose:** Short nose with broad tip, long philtrum, anteverted nares, and epicanthal folds.

**Mouth and oral structures:** Macrostomia with carp mouth, thin upper lip, highly arched narrow palate, and cleft lip/palate.

**Neck:** Short neck and torticollis.

**Thorax:** Short sternum.

**Abdomen:** Umbilical and inguinal hernia and single umbilical artery.

**Hand and foot:** Long slender and hypoplastic fingers, clinodactyly, syndactyly, and camptodactyly. Pes planus, equinovarus and equinovalgus occur in some cases. Dermatoglyphic findings consist mainly of single palmar creases. Syndactyly of the fingers and toes and clubfoot. Dermatoglyphic findings consist mainly of abnormal palmar creases.

**Extremities:** Limited hip abduction, loose joints, and joint myotonia. Stiff joints or joint laxity.

**Spine:** Kyphosis and scoliosis.

**Muscles:** Hypotonia.

**Skin:** Hyperextensible skin.

**Skin appendages:** Fingernails on dorsal and volar aspects of fifth finger.

**Nervous system:** Seizures. Seizures.

**Cardiovascular system:** Patent ductus arteriosus and ventricular septal defect.

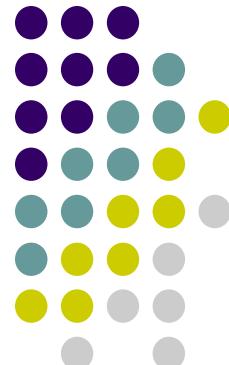
**Respiratory system:** Tracheo-esophageal fistula.

**Gastrointestinal system:** Intestinal malformations.

**Urogenital system:** Cystic kidneys, ectopic kidney, hydronephrosis, small penis, and cryptorchidism. Cryptorchidism.

**Growth and development:** Growth, motor, and mental retardation.

**Behavior and performance:** Failure to thrive and feeding difficulty.



# 7q Minus Syndrome

**Summary:** Deletion of the long arm of chromosome 7 with delayed mental and physical development and multiple anomalies involving the craniofacial structures, eyes, extremities (mainly split hand/split foot abnormality), and other parts.

**Head and neck:** Microcephaly with a small face, micrognathia, and prominent forehead.

**Ears:** Malformed ears with dysplastic pinnae. Mouth and oral structures; Occasional cleft lip with or without cleft palate, highly arched palate, and large mouth.

**Eyes:** Enophthalmos, exophthalmos, esotropia, exotropia, optic nerve atrophy, blue sclera, hypermetropia, glaucoma, coloboma, hypertelorism, and abnormal palpebral slant.

**Nose:** Epicanthal folds, bulbous tip, flat and broad nasal bridge, and long philtrum.

**Thorax:** Short sternum.

**Hand and foot:** Tapering fingers and overriding toes and ectrodactyly. Dermatoglyphic consist of abnormal creases of the palms and soles.

**Muscles:** Hypotonia.

**Skin:** Sacral dimple.

**Skin appendages:** Widow's peak and frontal upsweep of hairline.

**Nervous system:** Seizures and abnormal EEG.

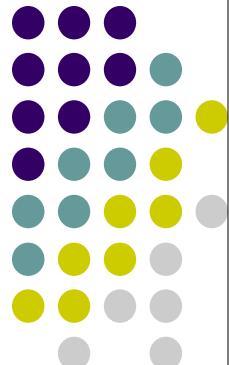
**Cardiovascular system:** Frequent congenital heart defects.

**Urogenital system:** Variable genital abnormalities including hypospadias and small penis.

**Immunologic system:** Frequent infections.

**Growth and development:** Growth and mental retardation.

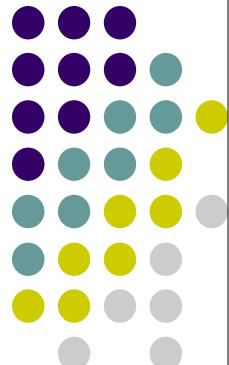
**Behavior and performance:** Involuntary movements and feeding difficulty.



# Agenesis of the Corpus Callosum

## Summary:

Agenesis of the Corpus Callosum (ACC) is a rare birth defect ([congenital disorder](#)) in which there is a complete or partial absence of the [corpus callosum](#). Agenesis of the corpus callosum occurs when the corpus callosum, the band of tissue connecting the two hemispheres of the brain, does not develop typically in utero. In addition to agenesis of the corpus callosum, other callosal disorders include hypogenesis (partial formation), dysgenesis (malformation) of the corpus callosum, and hypoplasia (underdevelopment) of the corpus callosum.



## Diagnosis:

Callosal disorders can only be diagnosed through a brain scan. [\[2\]](#) They may be diagnosed

## Cause:

Agenesis of the Corpus Callosum is caused by disruption to development of the fetal brain between the 5th and 16th week of pregnancy.[\[4\]](#) In most cases, it is not possible to know what caused an individual to have ACC or another callosal disorder. However, research suggests that some possible causes may include chromosome errors, inherited genetic factors, prenatal infections or injuries, prenatal toxic exposures, structural blockage by cysts or other brain abnormalities, and metabolic disorders.

## Signs and Symptoms:

Signs and symptoms of Agenesis of the Corpus Callosum and other callosal disorders vary greatly among individuals. However, some characteristics common in individuals with callosal disorders include vision impairments, low muscle tone ([hypotonia](#)), poor [motor coordination](#), delays in motor milestones such as sitting and walking, low perception of pain, delayed toilet training, chewing and swallowing difficulties, early speech and language delays, and social difficulties. Recent research suggests that specific social difficulties may be a result of impaired [face processing](#).[\[6\]](#) Unusual social behavior in childhood is often mistaken for or misdiagnosed as [Asperger's syndrome](#) or other [autism spectrum disorders](#). Other characteristics sometimes associated with callosal disorders include [seizures](#), [spasticity](#), early feeding difficulties and/or gastric reflux, hearing impairments, abnormal head and facial features, and mental retardation.

## Treatment:

There are currently no specific medical treatments for callosal disorders, but individuals with ACC and other callosal disorders may benefit from a range of developmental therapies, educational support, and services. It is important to consult with a variety of medical, health, educational and social work professionals. Such professionals include [neurologists](#), neuropsychologists, [occupational therapists](#), physical therapists, speech-language pathologists, [pediatricians](#), [geneticists](#), special educators, early intervention specialists, and adult service providers.

## Prognosis:

Prognosis varies depending on the type of callosal abnormality and associated conditions or syndromes. It is not possible for the corpus callosum to regenerate or degenerate (i.e., the corpus callosum will not regrow or diminish). [\[10\]](#). Although some individuals with callosal disorders have average intelligence and lead normal lives, neuropsychological testing reveals subtle differences in higher cortical function compared to individuals of the same age and education without ACC.

[http://en.wikipedia.org/wiki/Agenesis\\_of\\_the\\_corpus\\_callosum](http://en.wikipedia.org/wiki/Agenesis_of_the_corpus_callosum)

# Albinism

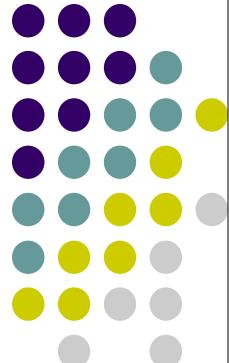
## Summary:

Albinism is a defect of melanin production. This defect results in the partial or full absence of pigment (color) from the skin, hair, and eyes.

## Diagnosis:

The most accurate way to determine albinism and the specific type is genetic testing. This is helpful in families with albinism and is useful for specific, isolated populations such as the Hopi Indian tribe of the Southwestern U.S.

The disorder may also be diagnosed based on the appearance of the skin, hair, and eyes. It is very helpful for an ophthalmologist to perform a complete examination of anyone with albinism. A electroretinogram test, to determine brain waves produced by light shined in the eye, can reveal "abnormal wiring" of the visual system in ocular forms of albinism.



## Causes:

Albinism results when the body is unable to produce or distribute pigment, called melanin, because of one of several possible genetic defects. In Type 1 albinism, defects in the metabolism of tyrosine lead to failure in converting this amino acid to melanin. This is due to a genetic defect in tyrosinase -- the enzyme responsible for metabolizing tyrosine.

Type 2 albinism is due to a defect in the "P" gene. Those with this type have slight pigmentation at birth.

In the most severe form of albinism (called oculocutaneous albinism), those affected appear to have hair, skin, and iris color that are white or pink as well as vision defects. This is inherited via an autosomal recessive process.

Albinism of just the eyes also occurs. This is called ocular albinism type 1 (OA1) and can be inherited via either an X-linked or an autosomal recessive process. In this form of albinism, skin color is usually normal and eye color may be in the normal range. However, examination of the eye will show that there is no pigment in the retina.

## Signs/Symptoms:

For those with albinism, one of the following will be present:

- Absence of pigment from the hair, skin, or iris of eyes
- Patchy absence of pigment (skin color, patchy)
- Lighter than normal skin and hair

Many forms of albinism have some of the following possible symptoms:

- Rapid eye movements (nystagmus)
- Strabismus (eyes not tracking properly)
- Photophobia (avoidance of light because of discomfort)

Decreased visual acuity or even functional blindness

## Treatment:

Treatment aims to ease symptoms and depends on the extent of the disorder.

The skin and eyes must be protected from the sun. Sunglasses (UV protected) may relieve photophobia. Sunburn risk can be reduced by avoiding the sun, by using sunscreens and covering completely with clothing when exposed to sun. Sunscreens should have a high SPF (sun protection factor).

## Prognosis:

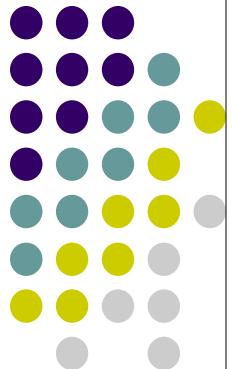
Mostly, albinism does not change one's expected lifespan. For those with Hermansky-Pudlak syndrome, however, life expectancy may be shortened due to lung disease or bleeding problems.

Activities for those with albinism may be limited by intolerance to the sun.

# Amniotic Construction Bands

## Summary:

Amniotic constriction bands are strands of fluid-filled sacs that surround a baby in the womb. They may cause a congenital (present from birth) deformity of the arms, legs, fingers, or toes.



## Diagnosis:

Physical examination is sufficient to make this diagnosis.

## Causes:

Amniotic constriction bands are caused by a type of damage to a part of the placenta called the amnion. The placenta carries blood to a baby still growing in the womb. Damage to the placenta can prevent normal growth development.

Damage to the amnion may produce fiber-like bands that can trap the arms, legs, fingers, or toes of the fetus. These bands reduce blood supply to the areas and cause them to develop abnormally. Amniotic constriction bands are relatively rare.

## Signs/Symptoms:

- Permanent band or indentation around an arm, leg, finger, or toe
- Baby may be born with all or part of an arm or leg missing (congenital amputation)
- Abnormal gap in the face (if it goes across the face, it is called a cleft)
- Defect of the abdomen or chest wall (if band is located in those areas)

## Treatment:

The severity of the deformity can vary widely from only one toe or finger being affected to an entire arm or leg missing or being severely underdeveloped. Therefore, the treatment varies widely. Often, the deformity is not severe and there is no treatment needed. In more serious cases, major surgery may be needed to reconstruct all or part of an arm or leg.

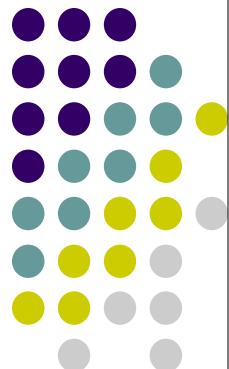
## Prognosis:

Again, the prognosis depends on the severity of the disease. Most cases are mild and the prognosis for normal function is excellent. More involved cases have more guarded prognoses.

# Amyoplasia Congenita Disruptive Sequence

**Amyoplasia** is a generalized lack in the newborn of muscular development and growth, with contracture and deformity at most joints. It is the most common form of [arthrogryposis](#).

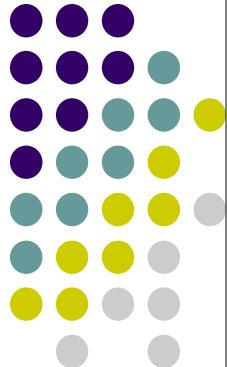
See [Arthrogryposis](#), page 18 for more information.



# Anencephaly

## Summary:

Anencephaly is the absence of a large part of the brain and the skull.



## Diagnosis:

The following tests can help identify anencephaly:

- Prepregnancy serum folic acid test
- Amniocentesis (done on the mother to determine if increased levels of alpha-fetoprotein are present)
- Alpha-fetoprotein levels during pregnancy (increased levels suggest a neural tube defect)
- Urine estriol levels during pregnancy
- Ultrasound to confirm the diagnosis

## Causes:

Anencephaly is a neural tube defect that occurs early in the development of an unborn baby. Neural tube defects involve the tissue that grows into the brain and spinal cord. Anencephaly results when the upper portion of the neural tube fails to close. Why this happens is not known. Possible causes include environmental toxins and low intake of folic acid during pregnancy.

Anencephaly occurs in about 4 out of 10,000 births. The exact number is unknown, because many of these pregnancies spontaneously abort. Having one anencephalic infant increases the risk of having another child with neural tube defects.

## Signs/Symptoms:

In the mother:

- If there is too much fluid in the uterus, this often suggests a problem with the pregnancy. This condition, called polyhydramnios, is seen before birth.

In the infant:

- Absence of the skull
- Absence of the brain (cerebral hemispheres and cerebellum)
- Facial feature abnormalities
- Heart defects

## Treatment:

No specific therapy is recommended, since this is a fatal condition.

## Prognosis:

This condition is usually fatal within days.

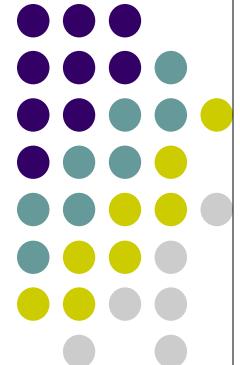
# Angelman Syndrome

## Summary:

Angelman's syndrome is a relatively rare [genetic disorder](#) that causes a variety of neurological problems, including [developmental delay](#), seizures, [speech impairment](#), and problems with movement and balance.

## Diagnosis:

Diagnosis is made by noting the characteristic cluster of symptoms. Careful chromosomal study can reveal abnormalities on chromosome 15 that are consistent with those identified in Angelman's syndrome.



## Causes:

Most cases of Angelman's syndrome can be traced to a genetic [abnormality](#) inherited from a maternal chromosome (15). A particular area of genes that should control the production and function of a protein called ubiquitin is either absent or ineffective. A minority of cases of Angelman's syndrome are due to new mutations in this same area of genes.

## Signs/Symptoms:

Children with Angelman's syndrome have an abnormally small, flat appearance to their skull. By one to two months of age, infants with the syndrome develop feeding difficulties. By six to 12 months, developmental delay is usually noted. Most children develop seizures by three years of age. Other characteristics of the syndrome include abnormally decreased muscle tone, fair skin and hair, protruding jaw, [hyperactivity](#), episodes of uncontrollable laughter, [difficulty sleeping](#), and severe problems with movement and balance. The disorder is sometimes called "happy puppet syndrome," because many children with the disorder have jerky, flapping movements of the arms; a stiff, jerky style of walking (gait); a happy, excited demeanor; and regular episodes of uncontrollable laughter.

## Treatment:

As of 2004 there is no cure for Angelman's syndrome. Treatments attempt to ameliorate the symptoms in order to improve the quality of life. Treatments may include anti-[seizure](#) medications, physical and [occupational therapy](#), and speech and language therapy.

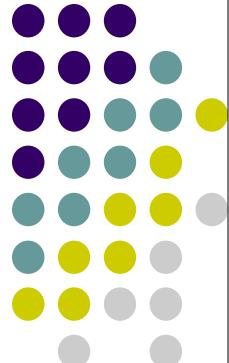
## Prognosis:

Most children with Angelman syndrome are severely developmentally delayed. They never acquire normal speech, and they require care and supervision throughout their lives.

# Anophthalmia

## Summary:

Anophthalmia is caused by a defect in embryonic development. The total absence of an eye is extremely rare and often a clinical sign associated with a broad range of genetic disorders or, more commonly, a sporadic mutation. Sporadic transmission occurs in the affected individual due to a genetic abnormality. It is not passed on from the parents, but usually due to a combination of environmental and genetic influences. More commonly anophthalmia clinically presents as a small cyst. The defect, which causes anophthalmia, is an absence of the optic vesicle, a structure important for eye development. The genetic abnormality usually occurs during weeks one to three after conception. It is estimated that the incidence of microphthalmia occurs 0.22 times per 1,000 live births. Anophthalmia can occur during adult life but not associated with a genetic cause.



## Diagnosis:

Microscope examination confirms the diagnosis of true anophthalmia. The clinician examines a piece of tissue taken from the eye and notes eviscerated tissue. For microphthalmia the confirmation can be established by eye measurements. Eyes that have an axial length <21 mm in an adult, or <19 mm in a one-year-old child are described as having microphthalmia.

## Causes:

Microphthalmia and anophthalmia can be caused by sporadic or genetic mutations. Anophthalmia is characterized by a total absence of an eye. Anophthalmia in an adult is usually caused by trauma, infection, tumor, or advanced eye disease.

## Treatment:

Large cysts causing microphthalmia should be aspirated or removed surgically. There is no known cure for anophthalmia or microphthalmia. For anophthalmia a prosthetic eye can be fitted which may involve surgery. Treatment for microphthalmia depends on the complexity of eye involvement.

## Prognosis:

For anophthalmia, prosthetic eyes should be seen by a specialist two to three times per year to assess fit, mobility, and smoothness. They are usually well tolerated and have good appearance and mobility. The clinical course for microphthalmia depends on the extent of smallness, but usually patients progress favorably without major treatment. Since the smallness is distinctly noticeable, there may be individual cosmetic considerations.

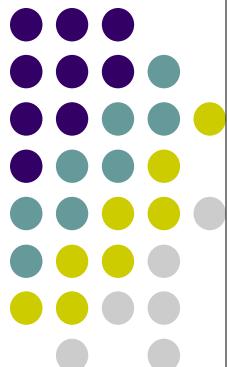
# Argininosuccinic Aciduria

## Summary:

Argininosuccinic aciduria is an inherited disorder that causes ammonia to accumulate in the blood. Ammonia, which is formed when proteins are broken down in the body, is toxic if the levels become too high. The nervous system is especially sensitive to the effects of excess ammonia.

Argininosuccinic aciduria usually becomes evident in the first few days of life. An infant with argininosuccinic aciduria may be lacking in energy (lethargic) or unwilling to eat, and have poorly controlled breathing rate or body temperature. Some babies with this disorder experience seizures or unusual body movements, or go into a coma. Complications from argininosuccinic aciduria may include developmental delay and mental retardation. Progressive liver damage, skin lesions, and brittle hair may also be seen.

Occasionally, an individual may inherit a mild form of the disorder in which ammonia accumulates in the bloodstream only during periods of illness or other stress.



# Arthrogryposis

## Summary:

Arthrogryposis, also known as **Arthrogryposis Multiplex Congenita**, is a rare [congenital disorder](#) that causes multiple [joint contractures](#) and is characterized by [muscle weakness](#) and [fibrosis](#). It is a non-progressive disease. The disease derives its name from Greek literally meaning 'curved or hooked joints'.

## Diagnosis:

To date, no prenatal diagnostic tools are available to test for the condition. Diagnosis is only used to rule out other causes. This is done by undertaking muscle [biopsies](#), [blood tests](#) and general clinical findings rule out other disorders and provides evidence for AMC.

## Causes:

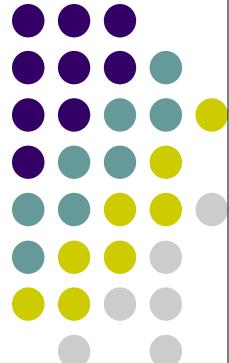
The cause as such, is unknown<sup>[9]</sup> though there have been several suggestions and factors suggested to play a role in AMC. This includes [hyperthermia](#) of the fetus, prenatal virus, fetal vascular compromise, septum of the uterus, decreased amniotic fluid, muscle and connective tissue developmental abnormalities.<sup>[5][6]</sup> In general, the causes can be classified into extrinsic and intrinsic factors.

## Signs/Symptoms:

There is a whole plethora of signs and symptoms for this group of diseases.<sup>[4]</sup> Some of the more common signs and symptoms are associated with the shoulder (internal rotation deformity), elbow (extension and pronation deformity), wrist (volar and ulnar deformity), hand (fingers in fixed flexion and thumb-in-palm deformity), hip (flexed, abducted and externally rotated, often dislocated), knee (flexion deformity) and foot ([clubfoot](#) deformity).<sup>[8]</sup> Complications may include [scoliosis](#), [lung hypoplasia](#) leading to respiratory problems, [growth retardation](#), [midfacial hemangioma](#), facial and jaw deformities, respiratory problems, and abdominal hernias. Cognition and speech are usually normal.

## Treatment:

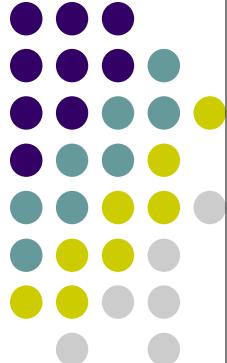
While there is no cure, symptoms and deformities may still be alleviated with various methods due to multiple contractures and weakness. [Physical therapy](#) intervention including stretching (may include [casting](#) and [splinting](#) program of affected joints), strengthening, mobility training, and training in ADL skills are undertaken to improve flexion and range of motion. Since there is a variety of different deformities, individually tailored [orthopaedic](#) correction is needed. Orthopedic surgery is usually needed to correct severely affected joints and limbs and symptoms such as clubfoot, hernia repair and correction if unilateral hip dislocation occurs.



# Asphyxia

## Summary:

Asphyxia neonatorum, also called birth or newborn asphyxia, is defined as a failure to start regular respiration within a minute of birth. Asphyxia neonatorum is a neonatal emergency as it may lead to [hypoxia](#) (lowering of oxygen supply to the brain and tissues) and possible brain damage or death if not correctly managed. Newborn infants normally start to breathe without assistance and usually cry after delivery. By one minute after birth most infants are breathing well. If an infant fails to establish sustained respiration after birth, the infant is diagnosed with asphyxia neonatorum. Normal infants have good muscle tone at birth and move their arms and legs actively, while asphyxia neonatorum infants are completely limp and do not move at all. If not correctly managed, asphyxia neonatorum will lead to hypoxia and possible brain damage or death.



## Diagnosis:

Diagnosis can be objectively assessed using the Apgar score—a recording of the physical health of a newborn infant, determined after examination of the adequacy of respiration, heart action, muscle tone, skin color, and reflexes. Normally, the Apgar score is of 7 to 10. Infants with a score between 4 and 6 have moderate depression of their vital signs while infants with a score of 0 to 3 have severely depressed vital signs and are at great risk of dying unless actively resuscitated.

## Causes

There are many causes of asphyxia neonatorum, the most common of which include the following: prenatal hypoxia (a condition resulting from a reduction of the oxygen supply to tissue below physiological levels despite adequate perfusion of the tissue by blood), umbilical [cord compression](#) during [childbirth](#), occurrence of a preterm or difficult delivery, and maternal anesthesia (both the intravenous drugs and the anesthetic gases cross the placenta and may sedate the fetus). High-risk pregnancies for asphyxia neonatorum include:

- maternal age of less than 16 years old or over 40 years old
- low socioeconomic status
- maternal illnesses, such as [diabetes](#), [hypertension](#), Rh-sensitization, severe [anemia](#)
- mothers with previous abortions, stillbirths, early neonatal deaths, or [preterm birth](#)
- lack of prenatal care
- abnormal fetal presentation or position
- [alcohol abuse](#) and [smoking](#) by the mother
- severe [fetal growth retardation](#)
- [preterm labor](#)

## Signs and Symptoms:

The symptoms of asphyxia neonatorum are bluish or gray skin color (cyanosis), slow heartbeat (bradycardia), stiff or limp limbs ([hypotonia](#)), and a poor response to stimulation.

## Prognosis:

The prognosis for asphyxia neonatorum depends on how long the new born is unable to breathe. For example, clinical studies show that the outcome of babies with low five-minute Apgar scores is significantly better than those with the same scores at 10 minutes. With prolonged asphyxia, brain, heart, kidney, and lung damage can result and also death, if the asphyxiation lasts longer than 10 minutes.

# Atresia of the External Auditory Canal/ Microtia

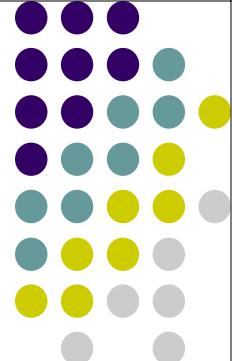
## What is Microtia?

The term microtia indicates a small, abnormally shaped or absent external ear. It can occur on one side only (called "unilateral") or on both sides (called "bilateral"). The unilateral form is much more common, occurring in approximately 90% of patients.

## What is Aural Atresia?

The term aural atresia refers to the absence of the ear canal. Patients who have microtia usually, but not always, also have aural atresia. Patients who have aural atresia have no hearing on that side but usually have completely normal hearing in the normal ear. Obviously, patients who have atresia in both ears will be sufficiently hard of hearing to require a hearing aid. (See below).

Patients who lack the ear canal also have structural abnormalities of the middle ear with absence of the eardrum and incomplete formation of the small middle ear bones, which allow conduction of hearing through the middle ear. Microtia and aural atresia tend to occur together because the outer ear and the middle ear evolve from a common embryologic origin.



## Is Microtia an Isolated Condition?

In most patients microtia and aural atresia occur as an isolated condition. In some patients, however, the ear deformity occurs in conjunction with other facial abnormalities. The most common condition in which microtia accompanies other anomalies is called "hemifacial microsomia". This condition has several other names which makes it difficult to read about for the layperson. For example, hemifacial microsomia is also known as the "1<sup>st</sup> and 2<sup>nd</sup> branchial arch syndrome" and the "oto-mandibular syndrome" as well as by other names. This condition can be quite variable but involves underdevelopment of all the structures on one side of the face, including the ear, the bones of the face, the fullness of the cheek tissue and the function of the facial nerve. Like isolated microtia, hemifacial microsomia can also occur on both sides of the face, which occurs in a minority of patients.

Another syndrome where microtia may be present is Treacher Collins Syndrome. This condition is always bilateral and tends to be an inherited syndrome and involves underdevelopment of the lower eyelids, the cheekbones, and the lower jaw. Patients who have severe manifestations of the syndrome frequently have upper airway obstruction and require a tracheostomy and/or surgical distraction of the lower jaw at a very young age.

Because of the association with these other conditions, patients with microtia may require access to other specialists and may require a genetics evaluation so that parents can be informed of any increase risk of these conditions in future children.

## What if Sufficient Hearing Does Not Exist?

The bone conduction hearing aids will be recommended within the first few months of life. The evaluation and surgical reconstruction of the hearing will not be recommended for several years. Unfortunately, patients with Treacher Collins Syndrome usually have sufficient anatomic abnormalities of the middle ear that the hearing cannot be surgically reconstructed and these patients are dependent on a hearing aid for life. The Food and Drug Administration in the United States have recently approved a relatively new type of hearing aid called the "bone anchored hearing aid" (BAHA) which is a small box attached to a small screw imbedded in the skull. This can be placed within the hair so it is not conspicuous and tends to provide better amplification of hearing than other hearing aids.

## How Often Should Hearing and Language Be Monitored?

Regular monitoring of hearing and language is important and should be performed at least as often as outlined in the attached protocol. If a child develops frequent middle ear infections, "otitis media", in the normal ear, the need for monitoring of hearing and language will be more frequent. Since patients who have microtia/aural atresia on one side are completely dependent on the other ear for hearing, it is important to make sure that any ear infections in the normal ear are treated completely to maximize the hearing in the better ear. Infections can result in accumulation of fluid in the middle ear, which can significantly reduce hearing. This condition is treatable and therefore regular follow up by a pediatric otolaryngologist is essential.

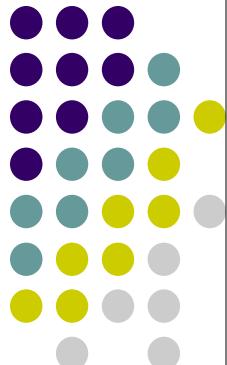
<http://www.microtia.com/whatis.html>

# Auditory Neuropathy

## Summary:

Auditory neuropathy is a hearing disorder in which sound enters the inner ear normally but the transmission of signals from the inner ear to the brain is impaired. It can affect people of all ages, from infancy through adulthood. The number of people affected by auditory neuropathy is not known, but the condition affects a relatively small percentage of people who are deaf or hearing-impaired.

People with auditory neuropathy may have normal hearing, or hearing loss ranging from mild to severe; they always have poor speech-perception abilities, meaning they have trouble understanding speech clearly. Often, speech perception is worse than would be predicted by the degree of hearing loss. For example, a person with auditory neuropathy may be able to hear sounds, but would still have difficulty recognizing spoken words. Sounds may fade in and out for these individuals and seem out of sync.



## Diagnosis:

Health professionals, including otolaryngologists (ear, nose, and throat doctors), pediatricians, and audiologists, use a combination of methods to diagnose auditory neuropathy. These include tests of [auditory brainstem response \(ABR\)](#) and [otoacoustic emissions \(OAE\)](#). The hallmark of auditory neuropathy is a negligible or very abnormal ABR reading together with a normal OAE reading. A normal OAE reading is a sign that the outer hair cells are working normally.

An ABR test monitors brain wave activity in response to sound using electrodes that are placed on the person's head and ears. An OAE test uses a small, very sensitive microphone inserted into the ear canal to monitor the faint sounds produced by the outer hair cells in response to stimulation by a series of clicks. ABR and OAE testing are painless and can be used for newborn babies and infants as well as older children and adults. Other tests may also be used as part of a more comprehensive evaluation of an individual's hearing and speech-perception abilities.

## Causes:

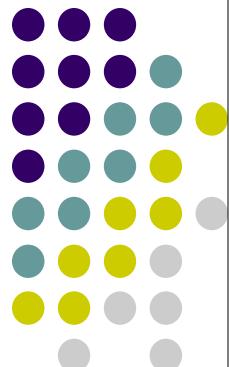
Although auditory neuropathy is not yet fully understood, scientists believe the condition probably has more than one cause. In some cases, it may involve damage to the inner hair cells--specialized sensory cells in the inner ear that transmit information about sounds through the nervous system to the brain. Other causes may include faulty connections between the inner hair cells and the nerve leading from the inner ear to the brain, or damage to the nerve itself. A combination of these problems may occur in some cases. Although outer hair cells--hair cells adjacent to and more numerous than the inner hair cells--are generally more prone to damage than inner hair cells, outer hair cells seem to function normally in people with auditory neuropathy.

# Autism Spectrum Disorders (ASD)

## Diagnostic Criteria for 299.00 Autistic Disorder:

- A. A total of six (or more) items from (1), (2), and (3) with at least two from (1) and one each from (2) and (3).**
- (1) qualitative impairment in social interaction, as manifested by at least two of the following:
- (a) marked impairments in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body posture, and gestures to regulate social interaction
  - (b) failure to develop peer relationships appropriate to developmental level
  - (c) a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people, (e.g., by a lack of showing, bringing, or pointing out objects of interest to other people)
  - (d) lack of social or emotional reciprocity ( note: in the description, it gives the following as examples: not actively participating in simple social play or games, preferring solitary activities, or involving others in activities only as tools or "mechanical" aids )
- (2) qualitative impairments in communication as manifested by at least one of the following:
- (a) delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gesture or mime)
  - (b) in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others
  - (c) stereotyped and repetitive use of language or idiosyncratic language
  - (d) lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental Level
- (3) restricted repetitive and stereotyped patterns of behavior, interests and activities, as manifested by at least two of the following:
- (a) encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus
  - (b) apparently inflexible adherence to specific, nonfunctional routines or rituals
  - (c) stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)
  - (d) persistent preoccupation with parts of objects
- B. Delays or abnormal functioning in at least one of the following areas, with onset prior to age 3 years:**
- (1) social interaction, (2) language as used in social communication, or (3) symbolic or imaginative play

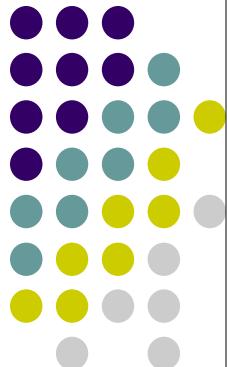
- C. The disturbance is not better accounted for by Rett's Disorder or Childhood Disintegrative Disorder.**



# Bilateral Micromelia

## Definition:

**Micromelia (micro·me·lia)** (mi”kro-me’le-ə) [*micro-* + *-melia*] is a developmental anomaly characterized by abnormal smallness or shortness of the limbs.

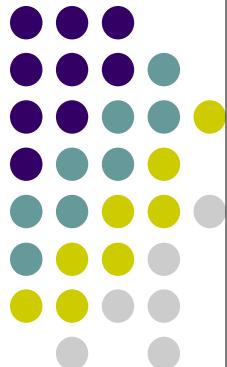


# Bilateral Optic Nerve Coloboma

## Summary:

Coloboma of the iris is a congenital (present since birth) defect of the iris of the eye. It is visible as a hole, split, or cleft in the iris.

Coloboma of the iris may appear as a black, round hole located in or adjacent to the iris (colored portion of the eye). It can appear as a black notch of varying depth at the edge of the pupil, giving the pupil an irregular shape. It can also appear as a split in the iris from the pupil to the edge of the iris.



A small coloboma, especially if it is not attached to the pupil, may allow a secondary image to focus on the back of the eye, causing a ghost image, blurred vision, or decreased visual acuity.

Coloboma may be associated with hereditary conditions, trauma to the eye, or eye surgery. The defect may extend to the retina, choroid, or optic nerve.

## Diagnosis:

A diagnosis is made by a physical exam and includes a detailed eye examination by an ophthalmologist. The ophthalmologist will also ask the individual when the symptoms were first noticed, determine what part of the eye is affected, the size and shape of the dark area in the eye, and ask for reports of any changes in the individual's vision.

Certain diagnostic tests are often used to diagnose coloboma. These include a visual acuity test, refraction test, and an in-depth history of symptoms.

## Causes:

Most cases of coloboma have no known cause and are not associated with other abnormalities. A small percentage of people with coloboma have other inherited developmental abnormalities.

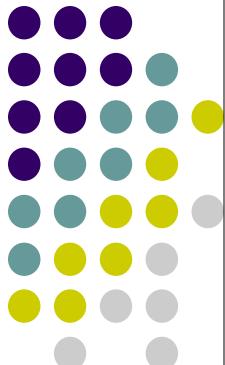
## Prognosis:

The effects of coloboma can be mild or severe, depending upon the extent and location of the gap or cleft. The gap itself is usually located at the bottom of the eye, but it may occur in the iris, choroid, macula or optic nerve.

A coloboma of the lens, particularly if it is large, may also include abnormalities of the iris and choroids, which increases the risk of retinal tearing. In severe cases of coloboma, the eye may be reduced in size. This condition is called microphthalmous, a disorder that can arise with or without coloboma.

The specific gene or genes responsible for coloboma have not yet been identified, but research continues throughout the United States, Scotland, and England.

# Bilateral Retinal Detachment with Blindness



## Summary:

The retina is the light-sensitive layer of tissue that lines the inside of the eye and sends visual messages through the optic nerve to the brain. When the retina detaches, it is lifted or pulled from its normal position. If not promptly treated, **retinal detachment** can cause permanent vision loss.

In some cases there may be small areas of the retina that are torn. These areas, called retinal tears or retinal breaks, can lead to retinal detachment.

## Symptoms:

Symptoms include a sudden or gradual increase in either the number of floaters, which are little "cobwebs" or specks that float about in your field of vision, and/or light flashes in the eye. Another symptom is the appearance of a curtain over the field of vision. A retinal detachment is a medical emergency. Anyone experiencing the symptoms of a retinal detachment should see an eye care professional immediately.

## Treatment:

Small holes and tears are treated with laser surgery or a freeze treatment called cryopexy. These procedures are usually performed in the doctor's office. During laser surgery tiny burns are made around the hole to "weld" the retina back into place. Cryopexy freezes the area around the hole and helps reattach the retina.

Retinal detachments are treated with surgery that may require the patient to stay in the hospital. In some cases a scleral buckle, a tiny synthetic band, is attached to the outside of the eyeball to gently push the wall of the eye against the detached retina. If necessary, a vitrectomy may also be performed. During a vitrectomy, the doctor makes a tiny incision in the sclera (white of the eye). Next, a small instrument is placed into the eye to remove the vitreous, a gel-like substance that fills the center of the eye and helps the eye maintain a round shape. Gas is often injected into the eye to replace the vitreous and reattach the retina; the gas pushes the retina back against the wall of the eye. During the healing process, the eye makes fluid that gradually replaces the gas and fills the eye. With all of these procedures, either laser or cryopexy is used to "weld" the retina back in place.

With modern therapy, over 90 percent of those with a retinal detachment can be successfully treated, although sometimes a second treatment is needed. However, the visual outcome is not always predictable. The final visual result may not be known for up to several months following surgery. Even under the best of circumstances, and even after multiple attempts at repair, treatment sometimes fails and vision may eventually be lost. Visual results are best if the retinal detachment is repaired before the macula (the center region of the retina responsible for fine, detailed vision) detaches. That is why it is important to contact an eye care professional immediately if you see a sudden or gradual increase in the number of floaters and/or light flashes, or a dark curtain over the field of vision.

# Bilateral visual acuity $\leq$ 20/70

## corrected vision best eye

### Summary:

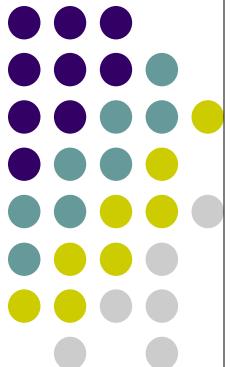
Low vision is a condition that can often be treated or offset by new vision aids.

Low vision is the loss of sight that is not correctable with prescription [eyeglasses](#), [contact lenses](#), or surgery. Low vision does not include complete blindness because there is still some sight. Often low vision can be improved with the use of visual aids.

Low vision includes different degrees of sight loss from having blind spots, poor night vision, and problems with glare to almost a complete loss of sight. The American Optometric Association defines low vision into two categories:

1. Partially sighted, meaning the person has visual acuity between 20/70 and 20/200 with conventional prescription lenses.
2. Legally blind, meaning the person has visual acuity no better than 20/200 with conventional correction and/or a restricted field of vision less than 20 degrees wide.

Anyone can be affected by low vision because it results from a variety of conditions and injuries. Because of age-related disorders like [macular degeneration](#), [glaucoma](#), and [cataracts](#), low vision is more common in adults over age 45 and still even more common in adults over age 75. One in six adults over age 45 have low vision; One in four adults over age 75 have low vision.



# Birthweight

## $\leq 1200$ grams or $\leq 28$ weeks gestational age

### Summary:

A baby with very low birthweight is often at increased risk for complications. The baby's tiny body is not as strong and he/she may have a harder time eating, gaining weight, and fighting infection. Because they have so little body fat, very low birthweight babies often have difficulty staying warm in normal temperatures.

Because many babies with very low birthweight are also premature, it can be difficult to separate the problems due to the prematurity from the problems of just being so tiny. In general, the lower the baby's birthweight the greater the risks for complications. The following are some of the common problems of very low birthweight babies:

- low oxygen levels at birth
- inability to maintain body temperature
- difficulty feeding and gaining weight
- infection
- breathing problems such as respiratory distress syndrome (a respiratory disease of prematurity caused by immature lungs)
- neurological problems such as intraventricular hemorrhage (bleeding inside the brain)
- gastrointestinal problems such as necrotizing enterocolitis (NEC) - a serious disease of the intestine common in premature babies.
- sudden infant death syndrome (SIDS)

Nearly all very low birthweight babies need specialized care in the Neonatal Intensive Care Unit (NICU) until they can gain weight and are well enough to go home.

Generally, the smaller the baby, the higher the risk. The survival of these tiny babies is directly related to their weight at birth.

Risks for long-term complications and disability are increased for babies with very low birthweight. Generally, the lower the birthweight, the greater the chances for developing intellectual and neurological problems, which may include the following:

- cerebral palsy
- blindness
- deafness
- mental retardation

### Causes:

The primary cause of very low birthweight is premature birth (born before 37 weeks gestation). Very low birthweight babies are often born before 30 weeks of pregnancy. Being born early means a baby has less time in the mother's uterus to grow and gain weight. Much of a baby's weight is gained during the latter part of pregnancy.

Another cause of very low birthweight is intrauterine growth restriction (IUGR). This is when a baby does not grow well during pregnancy because of problems with the placenta, the mother's health, or birth defects. Most very low birthweight babies who have IUGR are also born early, and are both very small and physically immature.

### Treatment:

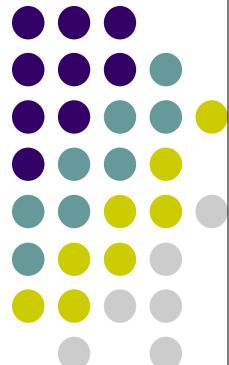
Specific treatment for very low birthweight will be determined by your baby's physician based on:

- your baby's gestational age, overall health, and medical history
- your baby's tolerance for specific medications, procedures, or therapies
- your opinion or preference

Care for very low birthweight babies often includes:

- care in the NICU
- temperature controlled beds
- special feedings, sometimes with a tube into the stomach if a baby cannot suck
- other treatments for complications

Very low birthweight babies may have a harder time "catching up" in physical growth because they often have other complications. Many very low birthweight babies are referred to special follow-up healthcare programs.

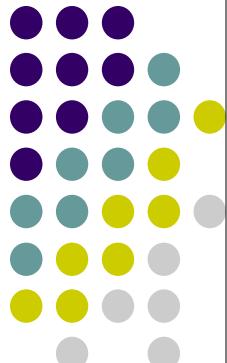


# Carpenter Syndrome: Acrocephalopolysyndactyly

## Summary:

Carpenter syndrome is a syndrome of genetic birth defects involving the skull, face, fingers, toes, and sometimes the heart. It is a form of ACPS (acrocephalopolysyndactyly), a group of rare genetic disorders that includes [Apert syndrome](#). The syndrome was named after the researcher who first described the condition.

It is not known exactly how often Carpenter syndrome occurs. About 100 cases have been described in the worldwide medical literature, so it is estimated that the syndrome occurs in one in 1,000,000 live births. Carpenter syndrome affects both males and females. It is inherited in an autosomal recessive manner, meaning that an individual has to receive two copies of the defective gene, one from each parent, in order to develop the syndrome.



## Diagnosis:

Since Carpenter syndrome is a genetic disorder, an infant is born with it. Diagnosis is based on the symptoms the child has, such as the appearance of the skull, face, fingers, and toes. No special test has been developed to confirm the diagnosis.

## Symptoms:

- Early closure (fusion) of the fibrous joints (cranial sutures) of the skull, called [craniosynostosis](#). This causes the skull to grow abnormally, and the head may seem short and broad (brachycephaly) or cone-shaped (acrocephaly).
- Facial features such as low-set, malformed ears, flat nasal bridge, wide upturned nose, downslanting [eyelid folds](#) (palpebral fissures), small underdeveloped upper and/or lower jaw.
- Short stubby fingers and toes (brachydactyly) and webbed or fused fingers or toes ([syndactyly](#)). Some individuals may have extra fingers or toes (polydactyly).

In addition, some individuals with Carpenter syndrome may have:

- congenital (present at birth) heart defects in about one-third to one-half of individuals
- abdominal [hernia](#)
- [undescended testes](#) in males
- short stature
- mild to moderate mental retardation (about 75 percent of individuals).

## Treatment:

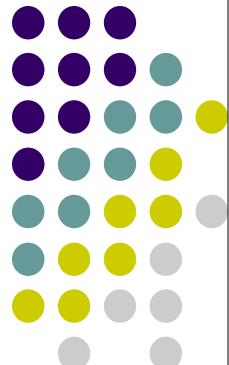
Treatment of Carpenter syndrome depends on the symptoms the individual has. Surgery may be needed if a life-threatening heart defect is present. Surgery may also be used to correct craniosynostosis by separating the abnormally fused skull bones to allow for growth of the head. This is usually done in stages starting in infancy. Surgical separation of the fingers and toes (if possible) may provide a better appearance but not necessarily better function. Physical, occupational, and speech therapy can help an individual with Carpenter syndrome reach his or her maximum developmental potential.

# Cataracts with Visual Impairment

## Summary:

In a normal eye, the cornea and lens focus objects on the retina. The lens should be transparent and able to change its focus to close up or far away. However, in some children the lens is opaque - a bit like the cooked white of an egg. This is called a cataract, and it means that light and images cannot reach the retina. It can occur in one or both eyes.

Hospital treatment may include an operation to remove the cataract(s) - as early as possible - and correction of the operated eye(s) with glasses, contact lenses or intra-ocular lenses (lens implants). Regular vision assessments are necessary and it is very important that you understand your child's treatment programme. Encouraging visual development is very much a joint effort between you and the clinic.



## Causes:

No identifiable cause is found in more than one third of infants born with cataracts in both eyes, and in over 90% of children with only one affected eye.

Some causes are known. For example, cataracts may be inherited from either parent and so the parents, brothers and sisters of affected children are examined in every case as other members of the family may have a partial cataract, which doesn't affect their vision. Some affected eyes may be slightly smaller than usual or have another eye condition as well as the cataract.

Approximately a quarter of children, usually those born with cataracts in both eyes, have other associated problems. For example, Rubella infection (German measles) can cause multiple disabilities, one of which is cataracts (in one or both eyes) resulting from infection early in pregnancy. These may be present at birth or develop in the first year of life. Rarely, other infections during pregnancy may cause cataracts in the newborn child.

Cataracts are common in young children with Down's syndrome, although they are not always bad enough to need to be removed.

A number of other rare general conditions (syndromes) can also result in cataracts. Some of these can be checked for through blood tests. As some of these conditions are inherited many children with cataract, together with their families, are seen in hospital by a clinical geneticist, who can help with diagnosis and provide advice about the risk of cataracts in future children.

Some children develop cataract later in childhood. This can be due to injury, drug exposure or radiation, or associated with other eye problems such as retinal disease. If no cause is found, it is possible there were slight cataracts at an earlier age that were not noticed until they started to cause problems.

## Diagnosis and Treatment:

Careful visual assessment is carried out using simple methods, such as watching the steadiness of your child's eyes and whether they prefer to use one eye all the time. Special visual assessment cards (acuity cards) (Figure 2) and electrical tests which pick up signals from the brain's visual areas may also be used (Figure 3). None of these tests is painful or harmful for your child.

Both unilateral (one eye) and bilateral (both eyes) cataracts in newborn babies can prevent them from getting enough visual stimulation during an important stage of development. If untreated, or treated late, this can lead to permanent changes in areas of the brain where vision is controlled, and cause reduced vision in one or both eyes. It is therefore important to do surgery as early as possible, preferably before three months of age, although children operated after this age may still develop reasonable eyesight.

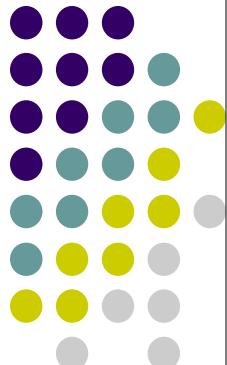
Less dense or 'partial' cataracts may not need surgery but do need to be carefully monitored so that they can be treated if they get worse.

It is often necessary to patch or cover the better eye in order to encourage the other eye ('lazy' or amblyopic eye) to work more. This may be suggested when the vision in one eye is worse than in the other, for example: if a cataract has been removed from one eye and the other eye is normal or if there is a partial cataract in one eye. Patching can be difficult but is necessary in order to encourage the vision in the lazy eye to develop (Figure 4).

# Caudal Regression Syndrome

## **Summary:**

Caudal regression syndrome (CRS), a complex neural tube defect (NTD), represents a continuum of congenital malformations ranging from agenesis of the lumbosacral spine to the most severe cases of sirenomelia (congenital anomaly with lower extremities fusion) and major visceral anomalies.<sup>2</sup>



## **Diagnosis:**

Diagnosis can be made during the second trimester with ultrasound. Diagnosis is also made by physical examination of the lower quadrant. Signs include lumbar and/or sacral agenesis, flattening of the buttocks, shortening of the gluteal cleft, and kyphoscoliosis or scoliosis. Also, genitalia may be malformed.

## **Treatment:**

The main goals include maintaining and improving renal, cardiac, pulmonary and GI function, preventing renal infection, and achieving continence. Orthopedic surgery is involved in correcting associated malformations. Physical therapy is involved in preventing secondary deformities, skin ulcers, and assisting in achieving some essential functions to improve the quality of life such as ambulating.

## **Prognosis:**

Depending on severity of the present conditions, surviving infants usually have a normal mental function, but require extensive urologic and orthopedic assistance. Their long-term morbidity consists mostly of neurogenic bladder dysfunction resulting in progressive renal

# Cerebral Palsy (CP)/Static Encephalopathy

## Summary:

Cerebral palsy (CP), or **static encephalopathy**, is the name for a collection of movement disorders caused by brain damage that occurs before, during, or shortly after birth. A person with CP is often also affected by other conditions caused by brain damage. The affected muscles of a person with CP may become rigid or excessively loose. The person may lose control of muscles, or have problems with balance and coordination. A combination of these is also possible. Those with CP may be primarily affected in the legs (paraplegia or diplegia), or in the arm and leg of one side of the body (hemiplegia), or all four limbs may be involved (quadriplegia).

A person with CP may also be affected by a number of other problems, including a seizure disorder, visual deficits, hearing problems, mental retardation, learning disabilities, and **attention-deficit hyperactivity disorder**. None of these is necessarily part of CP, however, they may accompany the disorder.

CP affects approximately 500,000 children and adults in the United States, and is diagnosed in more than 6,000 newborns and young children each year. It is not an inherited disorder, and as of yet there is no way to predict with certainty which children will develop CP. It is not a disease, and is not communicable. CP is a nonprogressive disorder, which means that symptoms neither worsen nor improve over time. However manifestation of the symptoms may become more severe over time. For example, rigidity of muscles can lead to contractures and deformities that require a variety of interventions.

## Types of Cerebral Palsy:

The impairments of CP become recognizable in early childhood. The type of motor impairment and its location are used as the basis for classification. There are five generally recognized types of impairment:

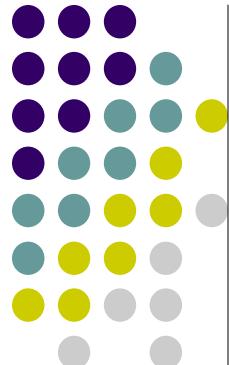
- **Spastic.** Muscles are rigid, posture may be abnormal, and fine motor control is impaired.
- **Athetoid.** It is marked by slow, writhing, involuntary movements.
- **Hypotonic.** Muscles are floppy, without tone.
- **Ataxic.** Balance and coordination are impaired.
- **Dystonic.** Impairment is mixed.

The location of the impairment usually falls into one of three broad categories:

- **Hemiplegia.** One arm and one leg on the same side of the body are involved
- **Diplegia.** Both legs; arms may be partially involved.
- **Quadriplegia.** All four extremities are involved.

A person with CP may be said to have spastic diplegia, or ataxic hemiplegia, for instance. CP is also termed mild, moderate, or severe, although these are subjective categories with no firm boundaries.

Loss of muscle control, especially of the spastic type, can cause serious orthopedic problems, including **scoliosis** (spine curvature), hip dislocation, or contractures. Contracture is shortening of a muscle, caused by an imbalance of opposing force from a neighboring muscle. Contractures begin as prolonged contractions, but can become fixed or irreversible without regular range of motion exercises. A fixed contracture occurs when the contracted muscle adapts by reducing its overall length. Fixed contractures may cause postural abnormalities in the affected limbs, including clenched fists, tightly pressed or crossed thighs, or equinus. In equinus, the most common postural deformity, the foot is extended by the strong pull of the rear calf muscles, causing the toes to point. The foot is commonly pulled inward as well, a condition called equinovarus. Contractures of all kinds may be painful, and may interfere with normal activities of daily living, including hygiene and mobility.



# Charge Association

## Summary:

CHARGE syndrome, also known as CHARGE association, is a group of major and minor malformations that have been observed to occur together more frequently than expected by chance. The name of the syndrome is an acronym for some of its features, and each letter stands for the following conditions:

- Coloboma and/or cranial nerves
- Heart Defects
- Atresia choanae
- Retarded Growth and Development
- Genital anomalies
- Ear anomalies

While these features have classically been used for identification of affected individuals, many other malformations and medical problems have been observed to occur with this syndrome.

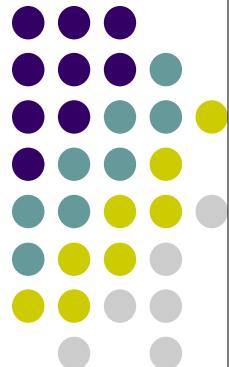
## Signs and Symptoms:

CHARGE syndrome is believed to be caused by a disruption of fetal growth during the first three months of pregnancy and affecting many different organ systems undergoing development at that time.

## Prognosis:

It has been noted in several studies that about half of patients diagnosed with CHARGE syndrome die from complications of the condition. One study suggests that 40% of those die after birth. Factors that appear to influence survival include the presence of CNS malformations, bilateral choanal atresia, TE fistula, and male gender. Heart abnormalities and brain stem dysfunctions were not found to be related to poor prognosis.

Significant hospitalizations are needed for most children with CHARGE syndrome.



# Citrullinemia

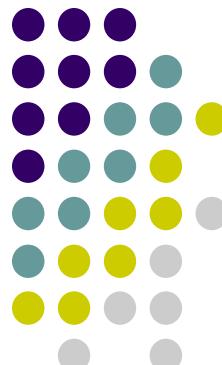
## Summary:

Citrullinemia is an inherited disorder that causes ammonia and other toxic substances to accumulate in the blood. Two forms of citrullinemia have been described; they have different signs and symptoms and are caused by mutations in different genes.

Type I citrullinemia (also known as classic citrullinemia) usually becomes evident in the first few days of life. Affected infants typically appear normal at birth, but as ammonia builds up in the body they experience a progressive lack of energy (lethargy), poor feeding, vomiting, seizures, and loss of consciousness. These medical problems are life-threatening in many cases. Less commonly, a milder form of type I citrullinemia can develop later in childhood or adulthood. This later-onset form is associated with intense headaches, partial loss of vision, problems with balance and muscle coordination (ataxia), and lethargy. Some people with gene mutations that cause type I citrullinemia never experience signs and symptoms of the disorder.

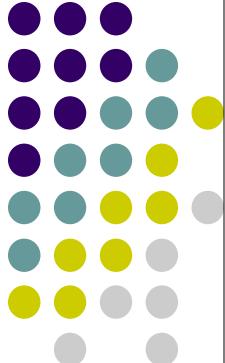
Type II citrullinemia chiefly affects the nervous system, causing confusion, restlessness, memory loss, abnormal behaviors (such as aggression, irritability, and hyperactivity), seizures, and coma. In some cases, the signs and symptoms of this disorder appear during adulthood (adult-onset). These signs and symptoms can be life-threatening, and are known to be triggered by certain medications, infections, surgery, and alcohol intake in people with adult-onset type II citrullinemia.

The features of adult-onset type II citrullinemia may also develop in people who as infants had a liver disorder called neonatal intrahepatic cholestasis caused by citrin deficiency (NICCD). This liver condition is also known as neonatal-onset type II citrullinemia. NICCD blocks the flow of bile (a digestive fluid produced by the liver) and prevents the body from processing certain nutrients properly. In many cases, the signs and symptoms of NICCD resolve within a year. Years or even decades later, however, some of these people develop the characteristic features of adult-onset type II citrullinemia.



# Cleft Hands

## Bilateral



### Summary:

Cleft hand is diagnosed by treating physicians after a thorough medical history and careful physical examination. X-rays are also used to confirm the diagnosis and to identify underlying involvement of the bones of the fingers and hand.

### Diagnosis:

Cleft hand is diagnosed by treating physicians after a thorough medical history and careful physical examination. X-rays are also used to confirm the diagnosis and to identify underlying involvement of the bones of the fingers and hand.

### Causes:

In the majority of patients, a cleft hand may be an isolated occurrence, affecting only the hand. In some patients, the presences of a cleft hand may be a part of a clinical syndrome with other systemic manifestations. In these situations, some patients with cleft hands may also have cleft lip, foot abnormalities, deafness, or congenital conditions affecting the heart and digestive systems.

The exact cause of cleft hand is unknown, though scientists and physicians continue to make progress in understanding the possible genetic causes of this rare condition.

### Treatment:

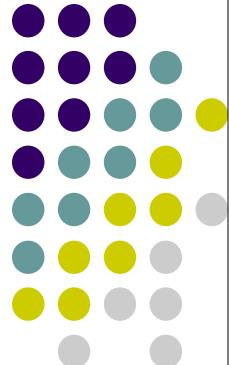
Not all patients require surgery for cleft hand, particularly if the overall hand function is not affected by the underlying deformity. However, in cases of significant functional or cosmetic differences, surgery may be recommended.

Many different surgical procedures may be performed for cleft hand. In general, the goals of surgery are to "close" the cleft and provide improvements in hand function. Special consideration is made to create a good working space between the thumb and index finger to allow for pinch and fine motor function. Surgery for cleft hand often involves reorganizing the skin and soft tissue, stabilizing or transferring the bones of the hand, and correcting any deformities of the fingers or thumb.

# Coffin Lowry Syndrome

## Summary:

Coffin-Lowry syndrome is a rare genetic disorder characterized by craniofacial (head and facial) and skeletal abnormalities, mental retardation, short stature, and hypotonia. Characteristic facial features may include an underdeveloped upper jaw bone (maxillary hypoplasia), a broad nose, protruding nostrils (nares), an abnormally prominent brow, downslanting eyelid folds (palpebral fissures), widely spaced eyes (hypertelorism), large ears, and unusually thick eyebrows. Skeletal abnormalities may include abnormal front-to-back and side-to-side curvature of the spine (kyphoscoliosis), unusual prominence of the breastbone (pectus carinatum), and short, hyperextensible, tapered fingers. Additional abnormalities



Other features may include feeding and respiratory problems, developmental delay, mental retardation, hearing impairment, awkward gait, flat feet, and heart and kidney involvement. The disorder affects males and females in equal numbers, however, symptoms may be more severe in males. Females may show mild mental retardation. The disorder is caused by a defective gene, RSK2, which was found in 1996 on the X chromosome (Xp22.2-p22.1). The gene codes for a member of a growth factor regulated protein kinase. It is unclear how changes (mutations) in the DNA structure of the gene lead to the clinical findings.

## Treatment:

There is no cure and no standard course of treatment for Coffin-Lowry syndrome. Treatment is symptomatic and supportive, and may include physical and speech therapy and educational services.

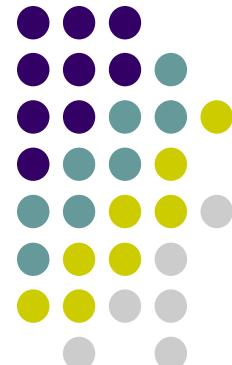
## Prognosis:

The prognosis for individuals with Coffin-Lowry syndrome varies depending on the severity of symptoms. Early intervention may improve the outlook for patients.

# Cornelia de Lange

## Summary:

Cornelia de Lange syndrome (CDLS), also known as Bachmann-de Lange syndrome, is a genetic disorder present from birth. In most individuals, CDLS is not associated with any family history of the disorder, but for others, siblings and/or parents may also have the syndrome. Researchers have identified a gene on chromosome 5 associated with CDLS.



## Symptoms

Many of the symptoms of Cornelia de Lange syndrome are present at birth. These include some or all of the syndrome's distinctive facial features:

- confluent eyebrows that appear arched and well-defined (99% of cases)
- long curly eyelashes (99%)
- low front and back hairlines (92%)
- turned-up nose (88%)
- down-turned angles of the mouth and thin lips (94%)
- small lower jaw and/or protruding upper jaw (84%).

Other physical abnormalities which may be present at birth or detected as the child grows may include:

- very small head (microcephaly) (98% of cases)
- eye and vision problems (50%)
- excessive body hair, which may thin as the child grows (78%)
- short neck (66%)
- hand abnormalities, such as missing fingers, very small hands, and/or inward deviation of the pinky fingers
- heart defects.

Infants with Cornelia de Lange syndrome are generally born small, sometimes prematurely. The infant has very tense muscles, has trouble feeding, and may have a low-pitched weak cry.

## Language and behavior problems

Infants with CDLS do not develop as quickly as other children. Most have mild to moderate mental retardation, but some may be profoundly retarded (IQ range 30-85). Because of problems with the mouth, hearing impairment, and developmental delay, children with CDLS often have speech delay.

Behavior problems for children with CDLS may include hyperactivity, self-injury, aggression, and sleep disturbance. These children may appear to have autism due to a diminished ability to relate to other people, repetitive behavior, difficulty with facial expression of emotion, and language delay.

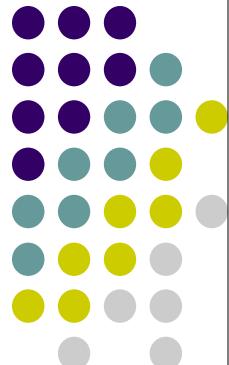
## Treatment

Treatment focuses on helping each child achieve his or her potential in terms of development and language, and medical care for physical problems. Infants benefit from early intervention programs for improving muscle tone, managing feeding problems, and developing fine motor ability. Life expectancy is normal if the child was born without major internal physical malformations such as heart defects.

# Cortical Blindness

## Summary:

Cortical Visual Impairment (CVI) is a temporary or permanent visual impairment caused by the disturbance of the posterior visual pathways and/or the occipital lobes of the brain. The degree of vision impairment can range from severe visual impairment to total blindness. The degree of neurological damage and visual impairment depends upon the time of onset, as well as the location and intensity of the insult. It is a condition that indicates that the visual systems of the brain do not consistently understand or interpret what the eyes see. The presence of CVI is not an indicator of the child's cognitive ability.



## Causes:

The major causes of CVI are asphyxia, perinatal hypoxia ischemia ("hypoxia": a lack of sufficient oxygen in the body cells of blood; "ischemia": not enough blood supply to the brain), developmental brain defects, head injury, hydrocephalus, and infections of the central nervous system, such as meningitis and encephalitis.

## Signs/Symptoms:

Initially, children with CVI appear blind. However, vision tends to improve. Therefore, Cortical Visual Impairment is a more appropriate term than Cortical Blindness. A great number of neurological disorders can cause CVI, and CVI often coexists with ocular visual loss so the child should be seen by both a pediatric neurologist and a pediatric ophthalmologist. The diagnosis of Cortical Visual Impairment is a difficult diagnosis to make. It is diagnosed when a child has poor or no visual response and yet has normal pupillary reactions and a normal eye examination. The child's eye movements are most often normal. The visual functioning will be variable. The result of an MRI (Magnetic Resonance Imaging) in combination with an evaluation of how the child is functioning visually, provide the basis for diagnosis.

# Cri Du Chat

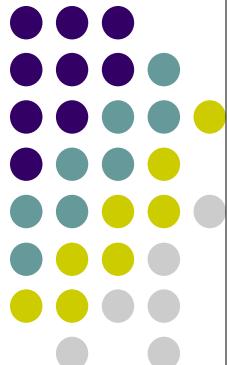
## Summary:

Cri du chat syndrome is a group of symptoms that result from missing a piece of [chromosome](#) number 5. The syndrome's name is based on the infant's cry, which is high-pitched and sounds like a cat.

## Causes, incidence, and risk factors

The cri du chat syndrome is caused by the deletion of information on chromosome 5. It is likely that multiple genes on chromosome 5 are deleted. One deleted gene, called TERT (telomerase reverse transcriptase) is involved in control of cell growth, and may play a role in how some of the features of cri du chat develop.

The cause of this rare chromosomal deletion is not known, but it is expected that the majority of cases are due to spontaneous loss of a piece of chromosome 5 during development of an egg or sperm. A minority of cases result from one parent carrying a rearrangement of chromosome 5 called a translocation. Between 1 in 20,000 and 1 in 50,000 babies are affected. This disease may account for up to 1% of individuals with severe mental retardation. Infants with cri du chat syndrome commonly have a distinctive cat-like cry. They also have an extensive grouping of abnormalities, with severe mental retardation being the most important.



## Symptoms

- High-pitched cry sounds like a cat
- [Low birth weight](#) and slow growth
- Small head ([microcephaly](#))
- Wide-set eyes (hypertelorism)
- Downward slant to the eyes (palpebral fissures)
- Small jaw ([micrognathia](#))
- [Low-set ears](#) (may be malformed)
- Skin tags just in front of the ear
- Partial webbing or fusing of fingers or toes
- Single line in the palm of the hand ([simian crease](#))
- [Mental retardation](#)
- Slow or incomplete development of motor skills

## Signs and tests

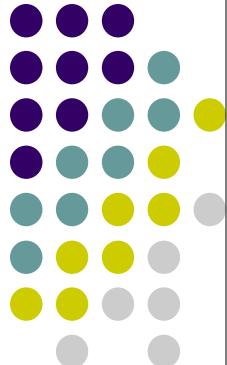
In addition to the other findings (listed with Symptoms), physical examination may show:

- [Inguinal hernia](#)
- [Diastasis recti](#) (separated abdominal muscles)
- Low muscle tone
- [Epicantal folds](#), an extra fold of skin over the inner corner of the eye
- Incompletely or abnormally folded external ears
- A missing portion of the short arm of chromosome 5 seen on chromosome analysis (if not, a more detailed type of genetic test called FISH analysis may reveal that a small piece of this chromosome is missing)
- An abnormal angle to the base of the skull seen on lateral skull x-ray

## Treatment and Prognosis

No specific treatment is available for this syndrome. The mental retardation must be addressed, and counseling is recommended for the parents. The outcome varies but mental retardation is the norm. Half of children learn sufficient verbal skills to communicate. The cat-like cry becomes less apparent with time.

# Cystinosis



## Summary:

Cystinosis is a rare genetic metabolic disease that causes cystine, an [amino acid](#), to accumulate in lysosomes of various organs of the body such as the kidneys, liver, eyes, muscles, pancreas, brain, and white blood cells. Although cystinosis primarily affects children, a form of the disease also occurs in adults.

## Diagnosis:

Cystinosis may be diagnosed prenatally by examining cystine levels in chorionic villi (obtained by [chorionic villus sampling](#), usually done at 10–12 weeks gestation) or in cells contained in amniotic fluid (obtained by [amniocentesis](#), usually done at 16–18 weeks gestation). In early infancy, cystinosis is usually diagnosed by measuring free cystine in white blood cells and skin fibroblasts.

## Signs and Symptoms:

Although the symptoms of cystinosis vary, depending on the type of disease present, general symptoms include:

- acidosis
- dehydration
- rickets
- growth retardation
- renal glomerular failure
- corneal ulcerations and retinal [blindness](#)
- delayed puberty
- swallowing difficulties

## Treatment:

Cystinosis is treated by a variety of pharmacologic and nonpharmacologic therapies as well as by surgical transplantation.

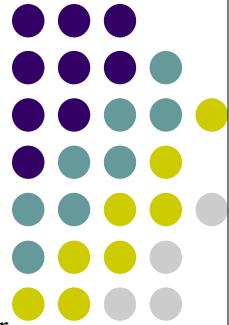
## Prognosis:

Since 1980, the prognosis of a child with cystinosis has greatly improved. However, if children with the disease receive no treatment, they rarely survive past the age of nine or ten.

# Dandy-Walker Malformation

## Summary:

Dandy-Walker malformation is a congenital (present at birth) condition involving several abnormalities in the development of the brain. The malformation appears to result from destructive processes, such as inflammation or [trauma](#), which block the circulation of cerebrospinal fluid (CSF) inside the head after the brain has been formed in the embryo.



## Diagnosis:

About 80% of children with Dandy-Walker malformation are diagnosed before the end of the first year, usually as a result of the signs of hydrocephalus. Following birth, the newborn's head circumference is measured to determine whether it has been enlarged by the development of cysts. As has already been mentioned, ultrasound screening before birth can detect some signs of hydrocephalus. Ultrasound screening is recommended if the family has a history of congenital neurologic abnormalities. [Genetic counseling](#) is recommended for parents who have already had a child with Dandy-Walker malformation as there is an increased risk that the malformation will reoccur in later pregnancies.

Imaging studies used to diagnose and monitor Dandy-Walker include:

- X rays of the skull to determine that the posterior fossa has been enlarged.
- [CT scan](#) or magnetic resonance imaging (MRI) tests to evaluate the size and shape of the fourth ventricle, the presence and size of the vermis, and the displacement of other parts of the brain by fluid pressure.
- Cranial ultrasound to evaluate the size of the ventricle or to assess the progression of hydrocephalus.
- Transillumination, a technique that shines a strong light through an organ or body part to assist in diagnosis. The posterior fossa may be transilluminated as part of the differential diagnosis of Dandy-Walker.

## Signs and Symptoms:

Some signs of Dandy-Walker malformation may appear before birth. It is possible to detect hydrocephalus by [ultrasound](#) as early as 15-18 weeks after conception. A newborn with hydrocephalus may have difficulty breathing, dilated veins visible on the scalp, and rapid head growth. Infants with Dandy-Walker may be slow to develop motor (movement) skills, and may have abnormally large skulls as a result of the fluid pressure inside the head.

Older children with Dandy-Walker malformation may have symptoms associated with fluid pressure inside the head including [vomiting](#), convulsions, and emotional irritability. If the cerebellum has been damaged, the child's sense of balance and coordination will be affected. About 20% of older children with Dandy-Walker have difficulty coordinating movements of the hands or feet (ataxia) or have involuntary jerking movements of the eyes (nystagmus). Developmental delays and [mental retardation](#) are more common. In some cases Dandy-Walker may be associated with an abnormal pituitary gland and delayed puberty. Other symptoms that sometimes appear in this group include unusually large head size, a bulge at the back of the head caused by fluid pressure in the posterior fossa, and abnormal breathing patterns.

## Treatment and Prognosis:

Treatment of Dandy-Walker malformation is usually focused on managing hydrocephalus when it is present. Hydrocephalus cannot be cured, but it can be treated surgically by placing a shunt in the ventricles of the brain to reduce fluid pressure. The shunt carries some of the CSF into another part of the body where it can be reabsorbed. Another important part of managing Dandy-Walker is treatment of conditions or abnormalities associated with it such as giving [anti-convulsant](#) medications for seizures or hormones to bring on puberty that has been delayed.

The prognosis for children with Dandy-Walker malformation is usually not encouraging because of the associated multiple abnormalities. Children with other congenital abnormalities occurring together with Dandy-Walker often do not survive. The affected person's chances of normal intellectual development depend on the severity of the malformation and the presence of other abnormalities.

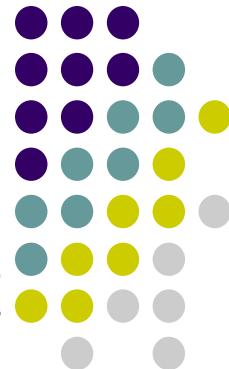
# Down Syndrome (Trisomy 21)

## Summary:

Down syndrome is the most common chromosome disorder and genetic cause of mental retardation. It occurs because of the presence of an extra copy of chromosome 21. For this reason, it is also called trisomy 21.

## Diagnosis:

Diagnosis is usually suspected at birth, when the characteristic physical signs of Down syndrome are noted. Once this suspicion has been raised, **genetic testing** (chromosome analysis) can be undertaken in order to verify the presence of the disorder. This testing is usually done on a blood sample, although chromosome analysis can also be done on other types of tissue, including the skin. The cells to be studied are prepared in a laboratory. Chemical stain is added to make the characteristics of the cells and the chromosomes stand out. Chemicals are added to prompt the cells to go through normal development, up to the point where the chromosomes are most visible, prior to cell division.



At this point, they are examined under a microscope and photographed. The photograph is used to sort the different sizes and shapes of chromosomes into pairs. In most cases of Down syndrome, one extra chromosome 21 will be revealed. The final result of such testing, with the photographed chromosomes paired and organized by shape and size, is called the individual's **karyotype**. An individual with Down syndrome will have a 47 XX+21 karyotype if they are female and a 47 XY+21 karyotype if they are male.

## Signs and Symptoms:

 (for complete list, follow link at the end of the page)

While Down syndrome is a chromosomal disorder, a baby is usually identified at birth through observation of a set of common physical characteristics. Not all affected babies will exhibit all of the symptoms discussed. There is a large variability in the number and severity of these characteristics from one affected individual to the next. Babies with Down syndrome tend to be overly quiet, less responsive to stimuli, and have weak, floppy muscles. A number of physical signs may also be present. These include: a flat appearing face; a small head; a flat bridge of the nose; a smaller than normal, low-set nose; small mouth, which causes the tongue to stick out and to appear overly large; upward slanting eyes; bright speckles on the iris of the eye (Brushfield spots); extra folds of skin located at the inside corner of each eye and near the nose (epicanthal folds); rounded cheeks; small, misshapen ears; small, wide hands; an unusual deep crease across the center of the palm (simian crease); an inwardly curved little finger; a wide space between the great and the second toes; unusual creases on the soles of the feet; overly flexible joints (sometimes referred to as being double-jointed); and shorter-than-normal stature.

## Treatment and Prognosis:

No treatment is available to cure Down syndrome. Treatment is directed at addressing the individual concerns of a particular patient. For example, heart defects may require surgical repair, as will duodenal atresia and T-E fistula. Many Down syndrome patients will need to wear glasses to correct vision. Patients with hearing impairment benefit from hearing aids. While some decades ago all children with Down syndrome were quickly placed into institutions for lifelong care, research shows very clearly that the best out-look for children with Down syndrome is a normal family life in their own home. This requires careful support and education of the parents and the siblings. It is a life-changing event to learn that a new baby has a permanent condition that will affect essentially all aspects of his or her development. Some community groups help families deal with the emotional effects of raising a child with Down syndrome. Schools are required to provide services to children with Down syndrome, sometimes in separate special education classrooms, and sometimes in regular classrooms (this is called mainstreaming or inclusion).

The prognosis for an individual with Down syndrome is quite variable, depending on the types of complications (heart defects, susceptibility to infections, development of leukemia, etc.). The severity of the retardation can also vary significantly. Without the presence of heart defects, about 90% of children with Down syndrome live into their teens. People with Down syndrome appear to go through the normal physical changes of aging more rapidly, however. The average age of death for an individual with Down syndrome is about 50 to 55 years. Still, the prognosis for a baby born with Down syndrome is better than ever before. Because of modern medical treatments, including antibiotics to treat infections, and surgery to treat heart defects and duodenal atresia, life expectancy has greatly increased. Community and family support allows people with Down syndrome to have rich, meaningful relationships. Because of educational programs, some people with Down syndrome are able to hold jobs.

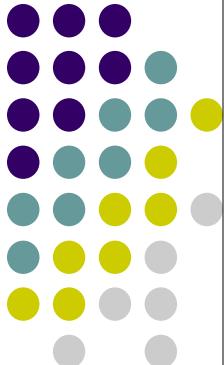
# Duplication short arm chromosome #20

## Synonyms:

Trisomy 20p

20p+

20p Duplication



## Where can I find additional information about chromosome 20?

You may find the following resources about chromosome 20 helpful. These materials are written for the general public.

NIH Publications - National Institutes of Health [National Human Genome Research Institute: Chromosome Abnormalities](http://ghr.nlm.nih.gov/ghr/) (<http://ghr.nlm.nih.gov/ghr/>)

Educational resources - Information pages [Genome News Network: Finished Sequence of Human Chromosome 20 \(December 21, 2001\)](http://ghr.nlm.nih.gov/ghr/) (<http://ghr.nlm.nih.gov/ghr/>)

MedlinePlus - Health information [Encyclopedia: Chromosome](http://search.nlm.nih.gov/medlineplus/) (<http://search.nlm.nih.gov/medlineplus/>)

You may also be interested in these resources, which are designed for genetics professionals and researchers.

[Research Resources](#) - Tools for researchers (8 links)

- [PubMed](#) - Recent literature
- [Map Viewer](#) - Genetic maps

# Encephalocele

## Summary:

An [encephalocele](#) is a defect characterized by the [herniation of brain](#) tissue and membranes through an opening in the cranium.

## Diagnosis:

Encephalocele can be diagnosed by [ultrasound](#) examination. Ultrasound examination is a screening test, the quality of which is affected by many factors including the machine used, skill of the operator, size and location of the lesion, and position of the fetus.

It is not likely that maternal serum alpha-fetoprotein testing (AFP) or [amniocentesis](#) would detect encephalocele. Alpha fetoprotein is a normal serum protein produced by the fetal liver. The AFP normally stays within the fetus, with a small amount present in the amniotic fluid from the fetal urine.

When there is an "open" neural tube defect, there is a high amount of AFP in the amniotic fluid and the maternal serum. Although encephalocele is a neural tube defect, AFP testing on maternal blood or amniotic fluid only detects open neural tube defects. Encephaloceles are closed neural tube defects, meaning they are covered by a thick covering. This covering does not allow the AFP to leak into the maternal blood or the amniotic fluid in increased amounts that would be detected by the aforementioned tests. Pregnancies in which an encephalocele is diagnosed should be offered an amniocentesis and amniotic fluid biochemistry to better understand the cause of the disorder.

[CT scan](#) can be used to determine the contents of the encephalocele once the baby is born. Some centers offer fetal MRI to attempt to classify the encephalocele prior to deliver. This is usually done at 22 weeks gestation.

## Signs and Symptoms:

Symptoms of encephalocele may include hydrocephalus, spastic [quadriplegia](#) (paralysis of all four limbs), [developmental delay](#), mental and growth retardation, uneven [gait](#) (ataxia), or seizures.

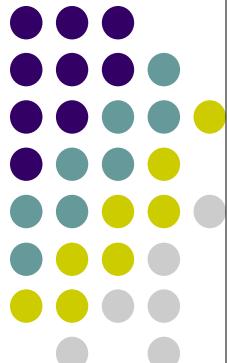
The size of the cerebral and skull abnormalities associated with encephaloceles are variable. Large encephaloceles are usually associated with [microcephaly](#) (abnormally small head). Microcephaly is usually associated with [mental retardation](#).

Occipital encephalocele may be asymptomatic. If the ventricles are involved, hydrocephalus may occur. Anterior encephalocele may progress in size and may be solid, cystic, or both. There may be microcephaly and/or [hydrocephaly](#), ocular hypertelorism (widespaced eyes), and [cleft palate](#). There may be problems with vision, breathing, and feeding in patients with anterior encephaloceles. Many patients have mental retardation.

## Treatment and Prognosis:

Nutrition, specifically [deficiency of folic acid](#), has been implicated as causing an increased risk for neural tube defects. All women of childbearing age should take 0.4 mg of folic acid to reduce the risk of birth defects. Women with a previous child with a neural tube defect should take 4.0 mg of folic acid. This amount has been shown to reduce the recurrence risk for neural tube defects by 50%.

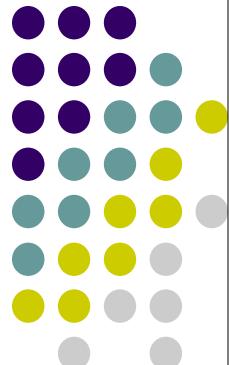
Size, location, and contents of the encephalocele determine the outcome for the child. Anterior encephaloceles have a much better prognosis than posterior. Mortality due to occipital encephalocele is reported as about 30% if hydrocephalus is present, and 2% if it is not. For all types of encephalocele with hydrocephalus, the mortality rate is 60%. Most patients with parietal encephalocele have associated brain malformations, and mental retardation occurs in 40%. Massive occipital encephalocele with microcephaly have a mortality rate of nearly 100%. Patients with encephaloceles that contain a single frontal lobe are more likely to have normal intelligence without hydrocephalus. Posterior have a poorer prognosis if they contain large amounts of the contents of the posterior fossa (an area of the brain at the back of the head), especially the brain stem. Complications such as [hemorrhage](#) or [air embolism](#) (stroke) can occur.



# Fazio-Londe Disease

## Summary:

Background: Progressive bulbar paralysis of childhood is characterized by progressive cranial nerve palsies especially bilateral facial weakness, swallowing difficulties and bilateral ptosis. Fazio-Londe disease (OMIM 211500) is usually classified with spinal muscular atrophies of autosomal recessive or dominant inheritance. Resembling diseases are Vlaetstra-van Laere syndrome (OMIM 211530) and Madras-type motor neuron disease. Diagnosis consists of the clinical features, electromyographic and histologic findings and the exclusion of other causes of progressive bulbar paresis.



# Fetal Alcohol Syndrome

## Summary:

Fetal alcohol syndrome is the manifestation of specific growth, mental, and physical birth defects associated with the mother's high levels of alcohol use during pregnancy.

## Causes:

Alcohol use or abuse by the pregnant woman subjects her to the same range of risks that alcohol has in the general population. However, it poses extreme and unique risks to the fetus and is associated with fetal alcohol syndrome (FAS).

Timing of alcohol use during pregnancy is also of importance. Alcohol use during the first trimester is more damaging than during the second trimester, which is, in turn, more damaging than use in the third trimester.

Alcohol ingested by a pregnant woman easily passes across the placental barrier to the fetus. Because of this, drinking alcohol can adversely affect the development of the baby.

A pregnant woman who drinks any amount of alcohol is at risk, since a "safe" level of alcohol ingestion during pregnancy has not been established. However, larger amounts appear to cause increased problems. Multiple birth defects associated with "classical" fetal alcohol syndrome are more commonly associated with heavy alcohol use or [alcoholism](#).

Fetal alcohol syndrome consists of the following abnormalities:

- Intrauterine growth retardation: growth deficiency in the fetus and newborn in all parameters -- head circumference, weight, height
- Delayed development with decreased mental functioning (mild to severe)
- Facial abnormalities including small head (microcephaly); small maxilla (upper jaw); short, up-turned nose; smooth philtrum (groove in upper lip); smooth and thin upper lip; and narrow, small, and unusual-appearing eyes with prominent epicanthal folds
- Heart defects such as [ventricular septal defect](#) (VSD) or [atrial septal defect](#) (ASD)
- Limb abnormalities of joints, hands, feet, fingers, and toes

## Signs and Symptoms:

Examination of the baby may show a [heart murmur](#) or other evidence of cardiac anomalies. As the baby grows, there may be evidence of delayed mental development. Facial and skeletal abnormalities may also be present.

Tests include:

- Pregnancy [ultrasound](#), which can demonstrate the presence of [intrauterine growth retardation](#)
- Infant ECG and echocardiogram, which can detect heart abnormalities
- Blood alcohol level in pregnant women who exhibit signs of intoxication (see [toxicology](#) screen)

## Treatment:

Pregnant women, or women trying to conceive, are encouraged to avoid drinking alcohol in any quantity. Pregnant alcoholic women should be involved in alcohol abuse [rehabilitation](#) programs, and monitored closely throughout pregnancy.

## Prognosis:

Outcome for infants with fetal alcohol syndrome is variable depending on the extent of symptoms, but almost none are normal when it comes to brain development.

The problems of the infant and child with fetal alcohol syndrome are diverse and difficult to manage. Cardiac defects may necessitate surgery. There is no effective therapy for mental retardation.



# Fragile X

## Summary:

Fragile X syndrome is a [genetic condition](#) involving changes in the long arm of the X chromosome. It is characterized by [mental retardation](#).

## Diagnosis:

A birth, there may be few outward signs of fragile X syndrome in the newborn infant. However, fragile X symptoms may include a large head circumference and oversized testes in males. An experienced geneticist may recognize subtle differences in facial characteristics. However, any child with signs of developmental delay of speech, language, or motor development with no known cause should be considered for fragile X testing, especially if there is a family history of the condition. Behavioral and developmental problems may indicate fragile X syndrome, particularly if there is a family history of mental retardation. Definitive identification of the fragile X syndrome is made

by means of a genetic test to assess the number of CGG sequence repeats in the FMR-1 gene. Individuals with the pre-mutation or full mutation may be identified through genetic testing. Genetic testing for and detection of the fragile X mutation can be performed on the developing baby before birth through [amniocentesis](#), [chorionic villus sampling](#) (CVS), and percutaneous umbilical [blood sampling](#). Prenatal testing is recommended after the fragile X carrier status of the parents has been confirmed, and the couple has been counseled regarding the risks of recurrence.

## Causes:

Fragile X syndrome is the most common form of inherited mental retardation in males and a significant cause in females. The inheritance is different from common dominant or recessive inheritance patterns. A fragile area on the X chromosome (called FMR1) has repeats in the genetic code. The more repeats, the more likely there is to be a problem. Boys and girls can both be affected, but because boys have only one X chromosome, a single fragile X is likely to affect them more severely.

## Signs and Symptoms:

- Family history of Fragile X syndrome, especially a male relative
- Mental retardation
- Large testicles (macro-orchidism) after puberty
- Large body size
- Tendency to avoid eye contact
- [Hyperactive behavior](#)
- Large forehead or ears with a prominent jaw

Family members who have fewer repeats in the FMR1 gene may not have mental retardation, but may have other problems. Women with less severe changes may have [premature menopause](#) or difficulty becoming pregnant. Both men and women may have problems with tremors and poor coordination.

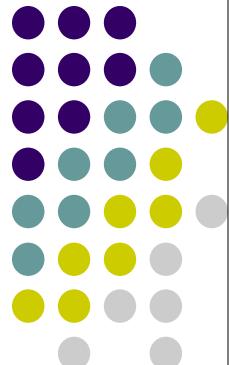
A specific genetic test (PCR) can now be performed to diagnose this disease. This test looks for an expanded mutation (called a triplet repeat) in the FMR1 gene. Formerly, a specific type of chromosome analysis was done and this may still be available.

There are very few outward signs of Fragile X syndrome in babies, but one is a tendency to have large head circumference. Measurement of oversized testes in males who have reached puberty may also suggest the diagnosis. An experienced geneticist may note subtle differences in facial characteristics. Mental retardation is the hallmark of this condition and, in females, this may be the only sign of the problem.

## Treatment and Prognosis:

There is no specific treatment for Fragile X syndrome. Instead, effort is directed toward training and education so that affected children can function at as high a level as is possible. Because the condition is not rare, specific educational approaches have been developed and tested.

The outcome depends on the extent of mental retardation.



# Glaucoma with Visual Impairment

## Summary:

Glaucoma refers to a group of disorders that lead to damage to the optic nerve, the nerve that carries visual information from the eye to the brain. Damage to the optic nerve causes vision loss, which may progress to blindness. Most people with glaucoma have increased fluid pressure in the eye, a condition known as increased intraocular pressure.

## Causes:

Glaucoma is the second most common cause of blindness in the US. There are four major types of glaucoma:

- Open angle (chronic) glaucoma
- Angle closure (acute) glaucoma
- Congenital glaucoma
- Secondary glaucoma

All four types of glaucoma are characterized by increased pressure within the eyeball, and therefore all can cause progressive damage to the optic nerve. Open angle (chronic) glaucoma is by far the most common type of glaucoma.

The front part of the eye is filled with a clear fluid called the aqueous humor. This fluid is constantly made in the back of the eye. It leaves the eye through channels in the anterior (front) chamber of the eye, and eventually drains into the bloodstream. The channels that drain the aqueous humor are in an area called the anterior chamber angle, or simply the angle.

**Congenital glaucoma**, which is present at birth, is the result of abnormal development of the fluid outflow channels of the eye. Surgery is required for correction. Congenital glaucoma is often hereditary.

## Symptoms:

### CONGENITAL

- Tearing
- Sensitivity to light
- Red eye
- Enlargement of one eye or both eyes
- Cloudiness of the front of the eye

## Signs and Tests:

An examination of the eye may be used to diagnose glaucoma. However, checking the intraocular pressure alone (tonometry) is insufficient because eye pressure changes. Examination of the inside of the eye by looking through the pupil, often while the pupil is dilated, is needed.

- Retinal examination
- Intraocular pressure measurement by tonometry
- Visual field measurement
- Visual acuity
- Refraction
- Pupillary reflex response
- Slit lamp examination
- Optic nerve imaging (photographs of the interior of the eye)
- Gonioscopy- use of a special lens to see the outflow channels of the angle

## Treatment:

Congenital glaucoma:

This form of glaucoma is almost always treated with surgery to open the outflow channels of the angle. This is done with anesthesia (asleep and no pain).

## Prognosis:

Congenital glaucoma:

Early diagnosis and treatment is important. If surgery is done early enough, many patients will have no future problems.

# Grade IV Intraventricular Hemorrhage (IVH)

## Summary:

Intraventricular [hemorrhage](#) (IVH) is bleeding into cavities in the brain called the ventricles. The [blood vessels](#) in the immature brain, including those in the [germinal matrix](#) next to the ventricles, are weak. The germinal matrix is a part of the brain that is active during fetal development but that disappears at about the 35th week of pregnancy. The blood vessels are thin, fragile, and vulnerable to fluctuations in blood flow, which can cause them to rupture and bleed.

The younger and smaller the baby, the higher the risk these blood vessels may be ruptured, usually in the first few days of life. A rupture causes blood to flow into one or both ventricles. The ventricles of the brain are normally filled with cerebrospinal fluid (CSF).

Severe IVH may first be suspected just by looking at the baby. Because the ventricles in the brain are filling up, pressure is created. Since the skull bones have not fused, a swelling of the head or the soft bones at the top of the head called the fontanelles, may be visible. Also, because weakened blood vessels in the brain are susceptible to damage from sudden blood pressure changes, abnormal [blood pressure](#) readings may alert medical staff to the possibility of IVH.

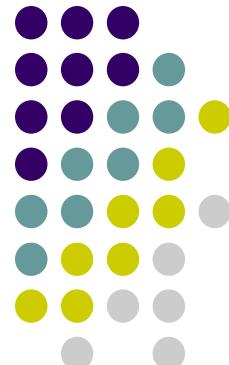
Because IVH can occur due to injury, if the condition is suspected, the circumstance of the premature baby's birth, for example a particularly rough and prolonged labour, will be looked into, as will signs of [infection](#), as they may be an indication of IVH.

Although IVH can have no initial symptoms, seizures, major clinical deterioration with [anemia](#), [hypotension](#), and metabolic [acidosis](#) may all be signs. At times, premature babies with IVH may appear not to be thriving and sickly in general.

A head [ultrasound](#) will be performed to confirm the [diagnosis](#). Additional tests include [blood work](#) to check for anemia, metabolic acidosis, and infection. If IVH is confirmed, it will be classified on a scale from Grade I to Grade IV, which is the most severe.

## Grades of IVH

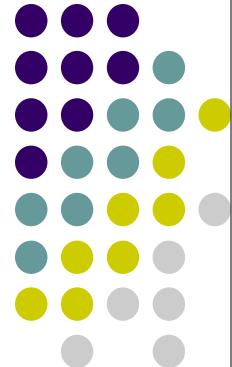
Classification	Medical name	What it means
Grade I	Subependymal or germinal matrix hemorrhage (SEH/GMH)	The bleeding is restricted to the germinal matrix and blood has not entered the ventricles.
Grade II	<a href="#">Intraventricular hemorrhage</a> (IVH)	Some blood is present in the ventricles, but not enough to enlarge them.
Grade III	Ventriculomegaly (VM)	Enough blood has entered the ventricles that the ventricles are enlarged.
Grade IV	Parenchymal hemorrhage (IPH)	The bleeding into the ventricles has resulted in a decreased blood supply to other parts of the brain, causing ischemic damage with subsequent bleeding.



# Hearing loss $\geq 20$ db

## Types of Hearing Loss

When describing hearing loss we generally look at three attributes: *type of hearing loss*, *degree of hearing loss*, and the *configuration of the hearing loss*. Hearing loss can be categorized by where or what part of the auditory system is damaged. There are **three basic types** of hearing loss: **conductive hearing loss**, **sensorineural hearing loss** and **mixed hearing loss**.



## Degree of Hearing Loss

Degree of hearing loss refers to the severity of the loss. There are five broad categories that are typically used. The numbers are representative of the patient's thresholds, or the softest intensity that sound is perceived:

Normal range or no impairment = 0 dB to 20 dB

Mild loss = 20 dB to 40 dB

Moderate loss = 40 dB to 60 dB

Severe loss = 60 dB to 80 dB

Profound loss = 80 dB or more

## Conductive Hearing Loss

Conductive hearing loss occurs when sound is not conducted efficiently through the outer ear canal to the eardrum and the tiny bones, or ossicles, of the middle ear. Conductive hearing loss usually involves a reduction in sound level, or the ability to hear faint sounds. This type of hearing loss can often be medically or surgically corrected.

Examples of conditions that may cause a conductive hearing loss include:

- Conditions associated with middle ear pathology such as fluid in the middle ear from colds, allergies (serous otitis media), poor eustachian tube function, ear infection (otitis media), perforated eardrum, benign tumors
- Impacted earwax (cerumen)
- Infection in the ear canal (external otitis)
- Presence of a foreign body
- Absence or malformation of the outer ear, ear canal, or middle ear

## Sensorineural Hearing Loss

Sensorineural hearing loss occurs when there is damage to the inner ear (cochlea) or to the nerve pathways from the inner ear (retrocochlear) to the brain. Sensorineural hearing loss cannot be medically or surgically corrected. It is a permanent loss. Sensorineural hearing loss not only involves a reduction in sound level, or ability to hear faint sounds, but also affects speech understanding, or ability to hear clearly. Sensorineural hearing loss can be caused by diseases, birth injury, drugs that are toxic to the auditory system, and genetic syndromes. Sensorineural hearing loss may also occur as a result of noise exposure, viruses, head trauma, aging, and tumors.

## Mixed Hearing Loss

Sometimes a conductive hearing loss occurs in combination with a sensorineural hearing loss. In other words, there may be damage in the outer or middle ear and in the inner ear (cochlea) or auditory nerve. When this occurs, the hearing loss is referred to as a *mixed* hearing loss.

# Herpes Encephalitis

## Summary:

Herpes encephalitis is an uncommon but life-threatening complication of herpes virus infection. Encephalitis is an inflammation or infection of the brain and central nervous system (CNS). The herpes virus usually causes a skin infection, causing painful blisters. The blisters last for several days and the virus can be spread from the blisters to other people. The blisters may start as cold sores or fever blisters around the mouth, or they may start as sores in the genital area.

There are several ways the virus might infect the brain and nervous system.

- In between outbreaks on the skin, the herpes virus lives in nerve cells close to the spinal column. It's likely that the virus spreads from these areas into the fluid that cushions the brain and spinal cord.
- The herpes virus may enter the central nervous system through infections in the head and neck, including the ears. Many people have herpes infections inside their noses or inside their ears. These areas are separated from the central nervous system by very thin bones and membranes, which the virus can pass through.
- The virus may spread to a newborn during delivery if the mother has herpes sores in the genital area. When this happens, the baby may have a total body herpes infection, including the central nervous system.

## Diagnosis:

The diagnosis can be difficult. Someone who has encephalitis is often not able to talk. Your provider will want to know your medical history, including:

- any history of herpes infections
- when and how long the symptoms occurred
- other medical conditions that might make it harder for the body to fight infection and easier for the virus to spread.

You will have a physical exam.

Spinal fluid collected from a lumbar puncture (spinal tap) can be tested for the herpes virus. Blood tests for herpes are also usually done. However, it can take days to weeks to get the test results.

## Symptoms:

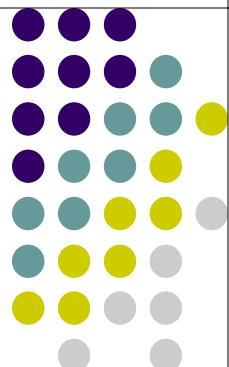
The symptoms of herpes encephalitis are similar to the symptoms of meningitis, a stroke, or epilepsy: They may change from mild to severe within several days or even several hours. At first the infection may cause flulike symptoms, including fever and aches, especially headache. The infection may then cause a gradual decrease in awareness. There may be disorientation, confusion, and seizures. Coma may follow.

## Treatment:

The main treatment is antiviral medicine given by IV (by vein), usually acyclovir. Because this infection can be life-threatening, the medicine may be started right away, before test results are known.

## Prognosis:

It can take a long time to recover from herpes encephalitis. This is especially true if the infection has caused problems such as speech problems, weakness on one side, or balance problems. These effects usually require physical therapy. Because the brain controls all the basic functions of thinking and moving, there may be temporary or permanent loss of any of these functions. Herpes encephalitis can be fatal. If a newborn is infected and survives the infection, the baby is likely to have damage to the brain or other parts of the nervous system damage.



# Holoprosencephaly

## Summary:

Holoprosencephaly is a disorder in which there is a failure of the front part of the brain to properly separate into what is commonly known as the right and left halves of the brain. This lack of separation is often accompanied by abnormalities of the face and skull. Holoprosencephaly may occur individually or as a component of a larger disorder.

## Diagnosis:

Prenatal [ultrasound](#) and computerized [tomography](#) can be used to determine whether the fetus has holoprosencephaly and its severity. After birth, physical appearance and/or imaging of the brain can determine a diagnosis of holoprosencephaly. Once a diagnosis of holoprosencephaly has been made, syndromes of which holoprosencephaly is a part must be considered. Forty-one percent of holoprosencephaly cases are thought to have a chromosomal abnormality as the primary cause. Holoprosencephaly is estimated to be found in the context of a larger syndrome in 25% of the remaining cases.

## Causes:

Holoprosencephaly is a feature frequently found in many different syndromes including, but not limited to: [trisomy 13](#), [trisomy 18](#), triploid, pseudotrisomy 13, Smith-Lemli-[Opitz syndrome](#), Pallister-Hall syndrome, Fryns syndrome, CHARGE association, [Goldenhar syndrome](#), frontonasal dysplasia, Meckel-Gruber syndrome, velocardiofacial syndrome, Genoa syndrome, Lambotte syndrome, Martin syndrome, and Steinfeld syndrome, as well as several teratogenic syndromes such as diabetic embryopathy, [accutane](#) embryopathy, and [fetal alcohol syndrome](#).

Holoprosencephaly has been linked to at least 12 different loci on 11 different **chromosomes**. Some candidate genes are Sonic hedgehog (abbreviated Shh, and located at 7q36), SIX3 (located at 2p21), and the ZIC2 gene (located on chromosome 13). The gene causing Smith-Lemli-Opitz syndrome, which affects cholesterol synthesis, also is interesting, since it is also obviously a candidate to cause holoprosencephaly.

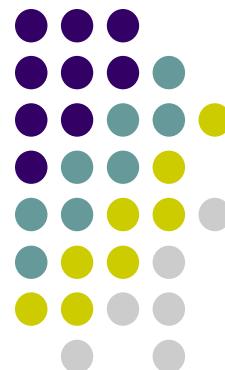
## Signs and Symptoms:

In holoprosencephaly alone, symptoms involve the brain and/or the face and bones of the face and skull. Facial abnormalities exhibit a wide range. In the most severe cases, persons with holoprosencephaly lack eyes and may lack a nose. Less severe is cyclopia, or the presence of a single eye in the middle of the face above the possibly deformed or absent nose. Even less severe are ethmocephaly and ceboccephaly, in which the eyes are set close together and the nose is abnormal. In premaxillary agenesis the patient has a midline cleft [lip and cleft palate](#) and close-set eyes. If the face is very abnormal, the patient is likely to have alobar holoprosencephaly, the most severe type. In addition to abnormalities of the face, children with alobar holoprosencephaly also have small brains (less than 100g). These children also have small heads unless they have excess cerebrospinal fluid. Excess cerebrospinal fluid can cause the head to be abnormally large. Persons with holoprosencephaly experience many problems due to brain malformations including in utero or neonatal death. Survivors may experience seizures, problems with muscle control and muscle tone, a delay in growth, problems feeding (choking and gagging or slowness, pauses, and a lack of interest), intestinal gas, [constipation](#), hormone deficiencies from the pituitary, breathing irregularities, and heart rhythm and heart rate abnormalities. These problems are usually least severe in lobar holoprosencephaly and most severe in alobar. Children with holoprosencephaly also experience severe deficiencies in their ability to speak and in their motor skills. An ominous sign that children with holoprosencephaly may exhibit is a sustained (lasting many hours or days) period of irregular breathing and heart rate. This may precede death. However, episodes lasting only minutes are usually followed by a full recovery.

## Treatment:

 (for more information, including prognosis, refer to link at the bottom)

Although no treatment exists for the underlying disease, symptomatic treatment can reduce the amount of fluid surrounding the brain and assist in feeding. Medical intervention can reduce or eliminate seizures and hormonal deficiencies. However, few treatments exist for the most serious aspects of the disease—breathing and heart arrhythmias (irregular heart rate)—or for the problems associated with [developmental delay](#) and poor muscle control. One important aspect of treatment is to help parents understand the effects of the disease and what may be expected from the child. Support groups, like the one listed at the end of this entry, may be important for this purpose. Parents should also be prepared to deal with a large number of health care professionals based on their child's particular needs.



# Hydranencephaly

## Summary:

Hydranencephaly is a rare [congenital deformity](#) (a deformity that occurs during fetal development) that is characterized by the absence of the cerebral hemispheres of the brain. Instead, the regions of the brain known as the left and right cerebral hemispheres are replaced by sacs that are filled with cerebrospinal fluid.

The absence of the cerebral hemispheres may not be apparent in the first days following birth. The normal and involuntary actions of a newborn such as sucking, swallowing, and crying all occur, as the brainstem controls these actions, and it is usually normal. Moreover, the baby with hydranencephaly appears physically normal, including the size of the head.

The normal behaviors of a growing infant reflect the functions of the left and right cerebral hemispheres. The left hemisphere is normally associated with the acquisition of language. The right hemisphere participates in the perception of space and distance. These sorts of skills are not yet developed in a newborn. Within several weeks to months of birth, the symptoms of hydranencephaly can become apparent.

## Diagnosis:

Diagnosis is based on the appearance of symptoms noted above. Diagnosis may not be made for weeks or months following birth, because of the initial normal appearance and behavior of the newborn. Prior to birth, [ultrasound](#) can reveal hydranencephaly, although techniques for surgical correction in the fetus have not been developed.

## Causes and Symptoms:

Within a few weeks of birth, the infant typically becomes irritable and the contraction of the muscles (muscle tone) becomes more pronounced. Muscles may spasm. **Seizures** can occur. Other symptoms that can develop with time include [poor vision](#) or the total [loss of vision](#), poor or no growth, deafness, [paralysis](#), and impaired intellectual development (such as language difficulty).

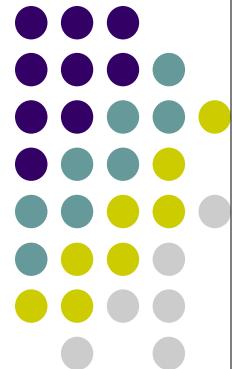
Hydranencephaly may be caused by a genetic defect, infection associated with vessels, or a trauma that occurs after the twelfth week of pregnancy. Maternal exposure to carbon monoxide early in pregnancy has also been implicated as a possible cause, along with the possibility of early [stroke](#) in the developing fetus, or as a result of infection with some viruses.

## Treatment:

There is no definitive treatment for hydranencephaly. Usually, symptoms are treated as they occur and support is provided to make the child as comfortable and happy as possible. Medications are given to control seizures and if excess cerebrospinal fluid collects near the brainstem, a shunt is usually surgically inserted to facilitate redirection of the excess

## Prognosis:

The long-term outlook for children with hydranencephaly is poor. Most children die in their first year of life, although survival past the age of 10 can rarely occur. Currently, the oldest known survivor was 20 years, 6 months old.



# Hydrocephaly/Hydrocephalus

## Summary:

Hydrocephalus is an accumulation of cerebrospinal fluid in the ventricles of the brain, leading to their enlargement and swelling.

## Causes:

Cerebrospinal fluid (CSF) is formed in a region of the brain known as the choroid plexus. CSF usually circulates through channels of the brain known as ventricles, as well as flowing around the outside of the brain and through the spinal canal.

When the circulation or absorption of this fluid is blocked, or excessive fluid is produced, the volume of fluid in the brain becomes higher than normal.

The accumulation of fluid puts pressure on the brain, forcing it against the skull and damaging or destroying the tissues.

The symptoms vary depending on the cause of the obstruction, the person's age when the problem develops, and the extent of brain tissue damage caused by the swelling.

In infants, fluid accumulates in the central nervous system, causing the fontanelle (soft spot) to bulge and the head to expand. An infant's head can enlarge because the bony plates that make up the skull have not yet fused together. However, once the skull bones are completely fused together, at about age 5, the skull will no longer expand.

In small children, hydrocephalus may be associated with infections acquired before birth, injury occurring during the birth process, congenital defects, tumors of the central nervous system, infections that affect the central nervous system (such as [meningitis](#) or [encephalitis](#)), and trauma before or after birth (including [subarachnoid hemorrhage](#)). [Myelomeningocele](#), a disorder involving incomplete closure of the spinal column, is strongly associated with hydrocephalus.

In older children, risks include a history of congenital or developmental defects, space-occupying lesions or tumors of the brain or spinal cord, central nervous system infections, bleeding anywhere in the brain, and trauma.

Hydrocephalus most often occurs in children, but may also occur in adults and the elderly.

## Symptoms:

### EARLY SYMPTOMS IN INFANTS

- Enlarged head (increased head circumference)
- Bulging fontanelles (soft spots of the head) with or without enlargement of the head size
- Separated sutures
- [Vomiting](#)

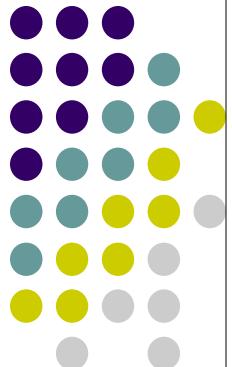
### SYMPTOMS OF CONTINUED HYDROCEPHALUS

- Irritability, poor temper control
- [Muscle spasticity](#) (spasm)

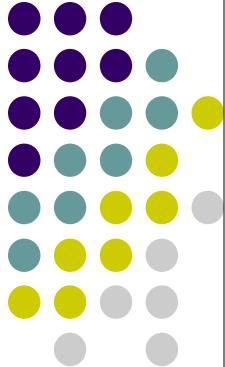
## Prognosis:

 (for more information, including Treatment, visit the link at the bottom of the page)

Untreated hydrocephalus has a 50-60% death rate, with the survivors having varying degrees of intellectual, physical, and neurologic disabilities. The outlook for treated hydrocephalus varies, depending on the cause. If the child survives for 1 year, more than 80% will have a fairly normal life span. Approximately one-third will have normal intellectual function, but neurologic difficulties may persist. Hydrocephalus that is caused by disorders not associated with infection has the best outlook, although hydrocephalus caused by tumors usually has a very poor prognosis.



# Incontinentia Pigmenti Syndrome



## Summary:

Incontinentia pigmenti is skin condition passed down through families that causes unusual blistering and changes in skin color.

## Causes:

Incontinentia pigmenti (IP) is caused by a genetic defect. In most cases, there is a problem with one of the genes located on the X chromosome.

## Symptoms:

Infants with IP are born with streaky, blistering areas. When the areas heal, they turn into rough bumps. Eventually, these bumps go away, but leave behind darkened skin, called hyperpigmentation. After several years, the skin returns to normal. In some adults, there may be areas of lighter colored skin (hypopigmentation).

IP is associated with central nervous system problems, including:

- Delayed development
- Loss of movement (paralysis)
- Mental retardation
- Muscle spasms
- Seizures

Persons with IP may also have abnormal teeth, hair loss, and visual problems.

## Treatment:

There is no specific treatment for IP. Treatment is aimed at the individual symptoms. For example, glasses may be needed to improve vision. Medicine may be prescribed to help control seizures or muscle spasms.

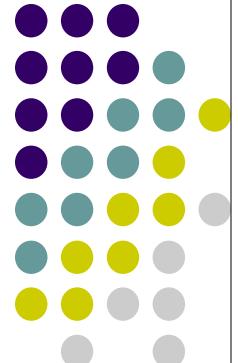
## Prognosis:

How well a person does depends on the severity of central nervous system involvement and eye problems.

# Infantile Spasms

## Summary:

Infantile spasms (IS) are **seizures** seen in **epilepsy** of infancy and early childhood. The typical pattern of an infantile spasm occurs soon after arousal from sleep, and involves a sudden bending forward and stiffening of the body, arms, and legs. Additionally, arching of the torso can also be seen during an infantile spasm. Infantile spasms typically last for one to five seconds and occur in clusters, ranging from two to 100 spasms at a time.



## Diagnosis:

Information about the child's seizures and about the pregnancy, birth, and progress since birth, will help the physician in making the diagnosis. The diagnosis of infantile spasms is made by a combination of the typical features, along with a characteristic **electroencephalogram** (EEG), which shows a very disorganized pattern termed hypsarrhythmia.

Most children with infantile spasms will need a number of tests, such as blood, urine, and cerebrospinal fluid (fluid which circulates around the brain and spinal cord) sampling, in an attempt to screen for any infection or **metabolic abnormality**. X-ray studies such as CT scans, **ultrasound**, or **MRI** will be performed to evaluate the structure of the brain.

## Causes and Symptoms:

The number of neurological diseases that can result in infantile spasms is very large, but some of the major categories include intrauterine injury and infection, disorders caused by lack of blood flow to the fetal brain, developmental malformations of the cerebral cortex, metabolic disorders, other genetic or chromosomal defects, **meningitis**, and tumors.

These seizures are assumed to reflect abnormal interactions between the cortex and brainstem structures. The frequent onset of the spasms in infancy suggests that an immature **central nervous system** may be important in the formation of infantile spasm syndrome. One theory states that the effect of different stressors in the immature brain produces an abnormal excessive secretion of **corticotropin**-releasing hormone, which causes spasms.

In 90% of children with the condition, infantile spasms occur in the first year of life, typically between three to six months of age. Often, in the beginning, the attacks are brief, infrequent and not typical, so it is quite common for the diagnosis to be delayed. Frequently, because of the pattern of attacks and the cry that a child gives during or after an attack, they are initially thought to be due to **colic**, or gastric distress.

The typical pattern is of a sudden flexion (bending forward) in a tonic (stiffening) fashion of the body, arms, and legs. Sometimes, however, the episodes are of the extensor type (arching). Usually, they are symmetrical, but sometimes one side is affected more than the other.

Typically, each episode lasts a few seconds, followed by a pause of a few seconds, and a further spasm. While single spasms may occur, infantile spasms usually occur in sets of several spasms in a row. It is common for babies with infantile spasms to become irritable and for their development to slow down or even regress until the spasms are controlled.

**For more information, including Treatment and Prognosis, please visit the following link:**

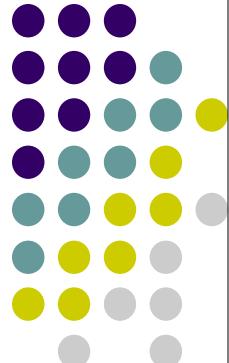
<http://www.healthline.com/galecontent/infantile-spasms/2>

# Isochromosome 18 p syndrome

## (18p Deletion Syndrome)

### Summary:

Deletion of the short arm of chromosome 18. It is one of the most frequently occurring chromosomal aberrations with minimal abnormalities visible at birth, which become more apparent at the age of three years. The phenotype is marked mainly by holoprosencephaly, brachycephaly, broad facies, blepharoptosis, downturned corners of the mouth, tooth abnormalities, broad neck with low posterior hairline, funnel chest, enlarged labia majora, hand abnormalities, mental retardation ranging from mild to severe, and other malformations. The phenotype varies from case to case, frequently reflecting the length and type of deletion: del(18p) mosaicism is associated with abnormalities which are similar to those in del(18p) and include microphthalmia and cataract and cyclopia may occur in del(18p) in mosaicism with dup(18p).



**Head and neck:** Brachycephaly, holoprosencephaly, premature synostosis of cranial sutures, broad facies, skull asymmetry, and micrognathia.

**Ears:** Large poorly rotated ears and occasional preauricular pits and rudimentary ears with absent auditory canals.

**Eyes:** Blepharoptosis, glaucoma, coloboma, and occasional microphthalmia, hypertelorism, downslanting or upslanting palpebral fissures, strabismus, nystagmus, microphthalmia, cataracts, and cyclopia.

**Nose:** Broad nose, epicanthal folds, and choanal stenosis.

**Mouth and oral structures:** Downturned corners of the mouth, macrostomia, delayed tooth eruption or anodontia, dental caries, cleft palate, and highly arched palate.

**Neck:** Short and broad neck.

**Thorax:** Funnel chest and rib anomalies.

**Hand and foot:** Large hands, short fingers, clinodactyly, subluxation of interphalangeal joints of the thumbs, and syndactyly of the toes. Simian creases occur are the occasional dermatoglyphic abnormalities.

**Extremities:** Coxa vara and hip dislocation and occasional leg asymmetry.

**Spine:** Scoliosis, kyphosis, and vertebral anomalies.

**Muscles:** Hypotonia.

**Skin:** Eczema and patchy hypopigmentation along Blaschko's lines on the trunk and hyperpigmentation on the buttocks.

**Skin appendages:** Low posterior hairline and alopecia.

**Nervous system:** Arrhinencephaly.

**Cardiovascular system:** Atrial and auricular septal defect.

**Gastrointestinal system:** Intestinal malrotation.

**Urogenital system:** Male genital hypoplasia, hypospadias, and enlarged labia majora.

**Endocrine system:** Thyroiditis and Graves disease (a triad of hyperthyroidism, goiter, and exophthalmos).

**Immunologic system:** Autoimmune disorders and immunoglobulin A deficiency.

**Hematopoietic system:** Polysplenia.

**Biochemical and metabolic features:** Juvenile diabetes.

**Growth and development:** Growth and mental retardation.

**Behavior and performance:** Autism. Amenorrhea.

**Heredity:** Most cases are de novo deletions and many other are due to de novo translocation between the long arms of an acrocentric and long arm of chromosome 18. Karyotypes include del(18)(pter-p11) del(18)(pter-q11), del(18)(p11.23-pter), del(18p) mosaicism, del(18p) in mosaicism dup(18q), del(18p) with dup(1)(q42-pter), del(18p) with dup(3)(pter-p21), del(18p) with dup(9q), del(18p) with XO/XY mosaicism, and del(18p) with XXY.

# Kabuki Syndrome

## Summary:

Kabuki syndrome is a rare disorder characterized by unusual facial features, skeletal abnormalities, and intellectual impairment. Abnormalities in different organ systems can also be present, but vary from individual to individual. There is no cure for Kabuki syndrome, and treatment centers on the specific abnormalities, as well as on strategies to improve the overall functioning and quality of life of the affected person.

## Diagnosis:

The diagnosis of Kabuki syndrome relies on [physical exam](#) by a physician familiar with the condition and by radiographic evaluation, such as the use of x rays or [ultrasound](#) to define abnormal or missing structures that are consistent with the criteria for the condition (as described above). A person can be diagnosed with Kabuki syndrome if they possess characteristics consistent with the five different groups of cardinal symptoms: typical face, skin-surface abnormalities, skeletal abnormalities, mild to moderate mental retardation, and short stature.

Although a diagnosis may be made as a newborn, most often the features do not become fully evident until early childhood. There is no laboratory blood or genetic test that can be used to identify people with Kabuki syndrome.

## Signs and Symptoms:

The signs and symptoms associated with Kabuki syndrome are divided into cardinal symptoms (i.e. those that are almost always present) and variable symptoms (those that may or may not be present). The cardinal and variable signs and symptoms of Kabuki syndrome are summarized in the table below.

## Treatment:

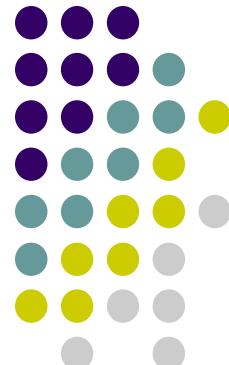
 (for more information on treatment, visit <http://www.healthline.com/galecontent/kabuki-syndrome/2>)

There is no cure for Kabuki syndrome. Treatment of the syndrome is variable and centers on correcting the different manifestations of the condition and on strategies to improve the overall functioning and quality of life of the affected individual.

## Prognosis:

The abilities of children with Kabuki syndrome vary greatly. Most children with the condition have a mild to moderate intellectual impairment. Some children will be able to follow a regular education curriculum, while others will require adaptations or modifications to their schoolwork. Many older children may learn to read at a functional level.

The prognosis of children with Kabuki syndrome depends on the severity of the symptoms and the extent to which the appropriate treatments are available. Most of the medical issues regarding heart, kidney or intestinal abnormalities arise early in the child's life and are improved with medical treatment. Since Kabuki syndrome was discovered relatively recently, very little is known regarding the average life span of individuals affected with the condition, however, present data on Kabuki syndrome does not point to a shortened life span.



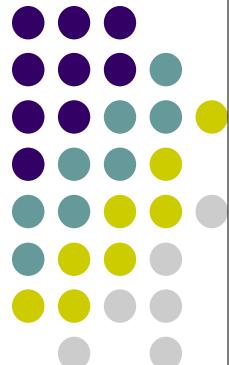
# Karsch-Neugebauer Syndrome

## Summary:

**Ectrodactyly**, commonly known as **lobster claw syndrome** [1], sometimes known as **Karsch-Neugebauer syndrome**, is a rare congenital deformity of the hand where the middle digit is missing, and the hand is cleft where the metacarpal of the finger should be. This split gives the hands the appearance of lobster claws. Ectrodactyly may also be known as "lobster claw hand", "split hand deformity", "split hand/foot malformation (SHFM)", "cleft hand", "ectrodactilia of the hand" or "Karsch-Neugebauer syndrome".

Ectrodactyly is an inherited condition, and often occurs in both the hands and the feet. Its inheritance pattern is autosomal dominant. It affects about 1 in 90,000 babies, with males and females equally likely to be affected. It is treated surgically to improve function and appearance. Prosthetics may also be used, and genetic counselling given to parents with the condition.

There are different forms of the disorder and each of them are connected with a different genetic mutation. Type I, the most frequent form has been found to be a mutation on chromosome 7 in a region that contains two homeobox genes, DLX5 and DLX6. [2]



# Klinefelter Syndrome

## Summary:

[Klinefelter syndrome](#) is a condition that occurs in men as a result of an extra X chromosome. The most common symptom is [infertility](#).

## Diagnosis:

Humans have 46 chromosomes, which contain all of a person's genes and DNA. Two of these chromosomes, the sex chromosomes, determine a person's gender. Both of the sex chromosomes in females are called X chromosomes. (This is written as XX.) Males have an X and a Y chromosome (written as XY). The two sex chromosomes help a person develop fertility and the sexual characteristics of their gender.



## Signs and Symptoms:

The patient may have the following signs:

- Small, firm testicles
- Small penis
- Sparse pubic, armpit, and facial hair
- Sexual problems
- Enlarged breasts (called [gynecomastia](#))
- Tall stature
- Abnormal body proportions (long legs, short trunk)

Adults may come to the doctor because of infertility. School-age children may be brought in to evaluate learning disabilities.

The following test results may be found:

- [Karyotyping](#) -- shows 47 XXY
- Semen count -- low
- Serum [testosterone](#) -- low
- Serum luteinizing hormone -- high
- Serum follicle stimulating hormone -- high
- Serum [estradiol](#) levels (a type of estrogen) -- high

## Treatment:

Testosterone therapy can achieve the following:

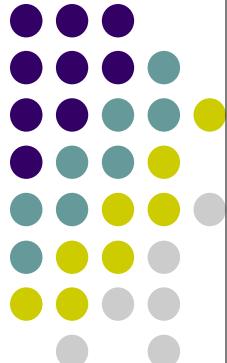
- Increase strength
- Improve appearance of muscles
- Grow body hair
- Improve mood and self esteem
- Increase energy and sex drive
- Improve concentration

Most patients are not able to father children. However, there are some cases of men with an extra X fathering healthy offspring, sometimes with the aide of infertility specialists.

## Prognosis:

Most patients can expect a normal, productive life. Social and educational supports can help patients reach their potential.

# Krabbe Disease



## Summary:

Krabbe disease is an inherited disorder characterized by a deficiency of the enzyme galactocerebroside beta-galactosidase (galactosylcereamidase). Deficiency of this enzyme causes the death of brain cells, a process that underlies the symptoms seen in Krabbe.

## Causes:

Krabbe disease is inherited as an autosomal recessive trait. It is most common among people of Scandinavian descent, but it generally affects about 1 in 150,000 infants. Absence of the enzyme galactocerebroside beta-galactosidase causes increasing destruction of myelinated neurons. This results in progressive destruction of the nervous system.

## Signs and Symptoms:

- Infantile irritability and sensitivity to loud sounds
- Feeding difficulties
- Vomiting
- Failure to thrive
- Unexplained fevers
- Changing muscle tone from floppy to rigid
- Seizures, deterioration in function of nerves in brain and body
- Infant who ceases to follow faces or motion (indicates blindness)
- Decreased hearing that progresses to deafness

Examination of the retina may show [optic atrophy](#). Abnormal posturing may be evident ([opisthotonos](#) and decerebrate posturing) in late stages of the disorder. There may be signs of deafness.

## Treatment:

There is no specific treatment for Krabbe disease. [Bone marrow transplantation](#) (with its own risks) has been attempted in early stages of the disease.

In the future there may be [enzyme replacement therapy](#), but it is in the early stages of development as of 2003. Prevention by prenatal or genetic testing is available.

## Prognosis:

The outcome is likely to be poor. On average, infantile-onset cases die before 2 years of age. Later-onset cases have survived into adulthood with neurologic disease.

# Larsen Syndrome

## Summary:

Larsen syndrome is an inherited condition characterized by congenital dislocation of multiple body joints along with other unusual features of the face, hands, and bones.

## Diagnosis:

Larsen syndrome should be suspected in any baby having multiple joint dislocations at birth. As of 2001, there is no genetic test to confirm the diagnosis and, thus, diagnosis must be based on clinical and x ray findings. Babies suspected to have the condition warrant a complete evaluation by a medical geneticist (a physician specializing in genetic syndromes).

Larsen syndrome is sometimes misdiagnosed as another condition called arthrogryposis, which involves multiple joint contractions. Larsen syndrome can be distinguished from this and other syndromes involving joint dislocations or contractions because of the unusual constellation of features found in the face and hands. Extra bones of the wrist, often seen in Larsen syndrome, are extremely rare in other syndromes.

Some people have very mild symptoms and may not have joint dislocations or other problems at birth. The diagnosis can be missed in these people unless they are carefully evaluated.

A person with dominantly inherited Larsen syndrome has a 50% chance with each pregnancy of having a child with the same disorder. Genetic counseling can help couples sort out their options for parenthood. Some couples would choose to adopt rather than take the chance of an affected child, others would go ahead with a pregnancy, and others would choose to have prenatal diagnosis. The only form of prenatal diagnosis available to date is ultrasound.

Fetal ultrasound performed by a specialist at 18-20 weeks of pregnancy can sometimes reveal signs of Larsen syndrome. Knee dislocations and hyperextension, club feet, fixed flexion of elbows, wrists, and fingers, and some of the characteristic facial features can sometimes be noted by ultrasound in affected fetuses. Physical findings from ultrasound can sug-

## Signs and Symptoms:

 (for more information, please visit <http://www.healthline.com/galecontent/larsen-syndrome>

The symptoms of Larsen syndrome are widely variable from person to person and can range from lethal to very mild, even among members of the same family.

Typical characteristics at birth are multiple joint dislocations that can include hips, elbows, wrists, and knees. Babies can be born with their knees in hyperextension with their ankles and feet up by their ears, a deformation called genu recurvatum. Clubfoot is common and persistent flexion, or contractures, of other joints, such as the wrist and fingers, can also occur.

## Treatment:

 (for more information on treatment, visit <http://www.healthline.com/galecontent/larsen-syndrome/2>

Treatment will vary according to the symptoms of a particular child. Joint problems require long-term orthopedic care. Dislocations, clubfeet, and joint contractures are treated with intensive physical therapy, splints, casting, and/or surgery. Physical therapy is also important after joint surgery to build up muscles around the joint and preserve joint stability. Occupational therapy may be helpful for children with wrist and finger contractures.

## Prognosis:

The effects of the syndrome vary markedly from person to person. Therefore, prognosis is based on the findings in a given individual. The usual causes of early death are either severe respiratory problems or compression of the cervical spine from vertebral instability.

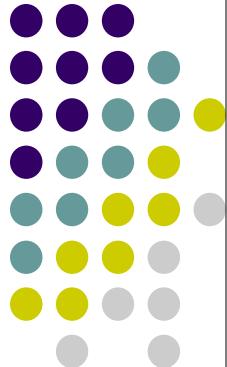
If careful and consistent orthopedic treatment is initiated early, prognosis can be good, with a normal life span. Weak and unstable joints and limited range of motion from contractures may cause walking difficulties and restrict other physical activities. Contact sports and heavy lifting should be avoided as anything that puts extra strain or pressure on the joints can cause harm. Swimming is a good activity because it helps strengthen muscles without joint strain.



# Leber's Congenital Amaurosis

## Summary:

Leber's Congenital Amaurosis (LCA) is a rare genetic eye disorder. Affected infants are often blind at birth or loss their sight within the first few of years of life. Other symptoms may include crossed eyes (strabismus); rapid, involuntary eye movements (nystagmus); unusual sensitivity to light (photophobia); clouding of the lenses of the eyes (cataracts); and/or abnormal protrusion of the front (anterior), clear portion of the eye through which light passes (cornea) (keratoconus). In addition, some infants may exhibit hearing loss, mental retardation, and/or a delay in the acquisition of skills that require the coordination of mental and muscular activity (psychomotor retardation). Leber's Congenital Amaurosis is inherited as an autosomal recessive genetic trait.



# Lennox-Gastaut Syndrome

## Summary:

Lennox-Gastaut syndrome (LGS) is one of the most severe forms of [epilepsy](#) (a seizure disorder) that develops in children usually between one and eight years old. It is characterized by several types of [seizures](#), [developmental delay](#), and behavioral disturbances such as poor social skills and lack of impulse control.

## Diagnosis:

LGS is diagnosed by some or all of the following symptoms, including:

- presence of a mixed seizure pattern
- some degree of developmental delay or intellectual disability
- distinct, slow, spike-and-wave pattern shown during [electroencephalogram](#) (EEG)

[Magnetic resonance imaging](#) ([MRI](#)) is an important part of the search for an underlying cause in a child with LGS. Abnormalities revealed by [MRI](#) associated with LGS include tuberous sclerosis, brain malformations, or evidence of previous brain injury.

## Causes:

Often no specific cause is identifiable, however, some of the known causes include:

- developmental malformations of the brain
- genetic brain diseases such as [tuberous sclerosis](#), and inherited metabolic brain diseases
- brain injury due to problems associated with pregnancy and birth, including prematurity, asphyxia, and/or low birth weight
- severe brain infections, including [encephalitis](#), [meningitis](#), [toxoplasmosis](#), and [rubella](#)

In many instances, LGS follows earlier [infantile spasms](#), which are sudden spasms or body bending, either at the trunk or neck. These episodes usually begin between three and eight months of age, and may develop into the mixed seizure pattern that characterizes LGS at two to three years of age.

## Treatment:

The [drug](#) treatment for LGS is based on the use of anti-[epileptic](#) drugs that are effective in reducing the number of seizures. However, the improvement often only lasts for a period of months or, rarely, a year or more. [Carbamazepine](#), sodium valproate, vigabatrin, [lamotrigine](#), and the [benzodiazepines](#) (clobazam, in particular) are often prescribed.

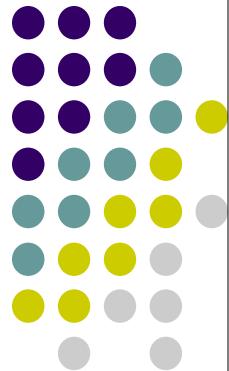
One alternative treatment involves a ketogenic diet in which 87% of calories come from fat, 6% from carbohydrates, and 7% from protein. The diet is restrictive, difficult to follow, but has shown results in reducing seizures in some affected children. Other less conventional therapies such as intravenous [immunoglobulin](#) therapy have also been attempted.

For children with repeated drop attacks, a procedure to cut the corpus callosum (the large group of nerve fibers connecting the two halves of the brain) may be very helpful. However, this procedure involves significant surgery and is not always effective, and seizures may return after several months or years.

An implanted vagus nerve stimulator is effective in reducing seizures in many children with Lennox-Gastaut syndrome. It is a device, similar in size to a heart pacemaker, that is implanted in the chest with a lead wrapped around the vagus nerve in the neck. It is able to stimulate the vagus nerve automatically at adjustable intervals. The device may take months to show maximum benefit, and requires a surgical procedure for insertion as well as for removal. The batteries require replacement approximately every eight to ten years, which entails further surgery.

## Prognosis:

The prognosis for individuals with LGS is unfavorable, but variable. Long-term studies of children with LGS found that a majority of patients continue to have typical LGS characteristics (mental retardation, treatment-resistant seizures) many years after onset. Children with an early onset of seizures, prior history of West syndrome, higher frequency of seizures, or constant slow EEG background activity have a worse prognosis than those with seizures beginning later in childhood. Tonic seizures may persist and be more difficult to control over time, while myoclonic and atypical absences become easier to control.

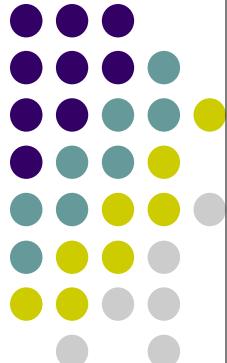


# Lissencephaly Syndrome

## Summary:

Lissencephaly, literally meaning smooth brain, is a rare birth [abnormality](#) of the brain that results in profound [mental retardation](#) and severe seizures.

Lissencephaly is caused by an arrest in development of the fetal brain during early pregnancy. The cerebral cortex, the top layer of the brain controlling higher thought processes, does not develop the normal sulci, the indentations or valleys in the cortex, and gyri, the ridges or convolutions seen on the surface of the cortex. Instead, the cortex in a person with lissencephaly is thickened and smooth with disorganized neurons that have not migrated to their proper places. The typical cortex has six layers of neurons, but brains with lissencephaly usually have only four.



## Signs and Symptoms:

Many babies with lissencephaly appear normal at birth, although some have immediate respiratory problems. After the first few months at home, parents typically notice feeding problems, inability to visually track objects, and lessened activity in their child. Breath-holding spells (apnea) and muscle weakness are also common. Seizures frequently begin within the first year of life, are usually severe, and are difficult to [treat with medication](#). Muscle weakness changes to [spasticity](#) (a condition of excessive muscle tension) over time. Repeated pneumonias from swallowing food down the airway and into the lungs are common.

Head size is usually within normal limits at birth; however, as the baby's body grows, head growth lags and a small head (microcephaly) results. Babies with isolated lissencephaly often have hollowing at the temples and small jaws, both thought to be a result of the abnormal brain shape. Genetic syndromes involving lissencephaly will include other symptoms and signs.

## Treatment:

There is no treatment or cure for lissencephaly. Seizures occur in almost all children with lissencephaly and are often difficult to control, even with the strongest anti-[seizure](#) medications. A severe type of seizure called infantile spasms can occur and may need to be treated with injections of [adrenocorticotrophic hormone](#) (ACTH), although this treatment is not always effective.

Feeding difficulties can include choking, gagging, or regurgitating food or liquid. [Aspiration](#), swallowing food down the trachea and into the lungs, is a serious problem that can lead to [pneumonia](#). Liquids and thin foods can be thickened to make swallowing easier. There are medications available to help with reflux. Children who continue to have serious problems may need a permanent feeding tube placed into the stomach to ensure adequate nutrition.

Physical and [occupational therapy](#) can help prevent or reduce tightening of the joints and help to normalize muscle tone.

## Prognosis:

Persons with classical lissencephaly usually need lifelong care for all basic needs. Many babies will not live past infancy, but the average age of survival depends on the particular syndrome involved, the type of lissencephaly, and the severity of the brain abnormalities in a given child. Babies with MDS usually die by two years of age, but the majority of persons with ILS live into childhood, although often not into adulthood. Many babies with cobblestone dysplasia die in infancy; however, some affected people have lived into their 20s. In contrast, persons with SBH have very variable signs and symptoms, may be asymptomatic, mildly affected or severely retarded, and may have near-normal or normal lifespans.

# Lowe Syndrome (oculo-cerebro-renal)

## Summary:

Lowe oculocerebrorenal syndrome is a rare [genetic condition](#) that affects males. It is caused by an enzyme deficiency. It affects many body systems including the eyes, the kidneys, and the brain.

## Diagnosis:

The diagnosis of Lowe oculocerebrorenal syndrome is based initially on the presence of the symptoms of the disorder. Lowe oculocerebrorenal syndrome is definitively diagnosed by measuring the activity of the enzyme phosphatidylinositol 4,5-bisphosphate 5-phosphatase. When the activity of this enzyme is very low it is diagnostic of Lowe oculocerebrorenal syndrome. In order to perform this test a small piece of skin must be removed from the patient's body (skin biopsy). The enzyme is then measured from cells in this skin sample. In some cases it is also possible to look for a mutation in the OCRL1 gene. The presence of mutation confirms the diagnosis of Lowe oculocerebrorenal syndrome in males.

## Signs and Symptoms:

The signs and symptoms of Lowe oculocerebrorenal syndrome are variable. Some individuals with Lowe oculocerebrorenal syndrome have many severe symptoms, while other affected individuals have fewer, more mild symptoms.

Eye problems are a common feature of Lowe oculocerebrorenal syndrome. Congenital cataracts are a classic feature of the disorder. These cataracts may be one of the first symptoms noticed during infancy. Approximately 50% of males with Lowe oculocerebrorenal syndrome will develop increased pressure behind the eye ([glaucoma](#)). This pressure can damage the eye. Other eye problems include [strabismus](#) (crossed or divergent eyes), [nystagmus](#) (uncontrollable rhythmic eye movements), and [microphthalmia](#) (small eyes).

The nervous system (brain and nerves) is also typically affected by Lowe oculocerebrorenal syndrome. Mental retardation is a common feature of Lowe oculocerebrorenal syndrome. It can vary between mild and severe. Some males with Lowe oculocerebrorenal syndrome have normal intelligence. Seizures and behavior disturbances can also be seen in individuals with Lowe oculocerebrorenal syndrome. Behavior disturbances can include temper tantrums, aggression, obsessions, and repetitive hand movements. One of the first signs of brain dysfunction caused by Lowe oculocerebrorenal syndrome is muscle weakness (hypotonia) during infancy.

Kidney problems are another common finding in individuals with Lowe oculocerebrorenal syndrome. The kidneys normally filter chemicals and acids from the body. The kidneys allow the body to keep needed substances and to remove unneeded substances through the urine. Individuals with Lowe oculocerebrorenal syndrome cannot do this properly, allowing needed substances (calcium, phosphate, etc.) to be excreted in the urine. This kidney disturbance can ultimately lead to kidney failure.

Individuals with Lowe oculocerebrorenal syndrome frequently have slow growth and have [short stature](#). Problems with bones can also develop due to the loss of certain substances through the kidneys. [Rickets](#) and easily breakable bones are common features. Joints may also become inflamed in individuals with Lowe oculocerebrorenal syndrome.

## Treatment:

There is currently no cure for Lowe oculocerebrorenal syndrome. Individuals with Lowe oculocerebrorenal syndrome benefit from therapies and regular medical care. [Physical therapy](#), occupational therapy, and speech therapy may be recommended due to developmental delays. Regular eye exams by an ophthalmologist are also recommended. Patients with Lowe oculocerebrorenal syndrome should be followed by a nephrologist (kidney doctor). [Dialysis](#) may ultimately be recommended for kidney failure.

## Prognosis:

The life span of males with Lowe oculocerebrorenal syndrome is limited by their multiple medical problems. Death by middle age is common. However, medical advances are improving the quality of life for individuals with this genetic condition.

# Marshal-Smith Syndrome

## Summary:

Marshall-Smith syndrome is a childhood condition involving specific facial characteristics, bone maturation that is advanced for the individual's age, failure to grow and gain weight appropriate for the individual's age, and severe respiratory (breathing) problems.

## Diagnosis:

Because there is no genetic testing available for Marshall-Smith syndrome, all individuals have been diagnosed through a careful physical examination and study of their medical history.

Advanced skeletal age can be seen on x rays of the patient's hands and wrists, since this is the typical way to assess bone age. A full x ray survey of the body is a good way to assess age of other bones as well. Advanced bone age is always seen in Marshall-Smith syndrome, but it may also be present in other genetic syndromes. **Sotos syndrome** involves similar skeletal findings, but individuals are generally larger than usual and can have mental delays. Weaver syndrome includes advanced skeletal maturation, but individuals are often larger than usual and have other specific facial characteristics (such as very narrow, small eyes). These and other conditions can be ruled out if the respiratory complications and facial characteristics seen in MSS are not present.

## Signs or Symptoms:

The most medically serious complication in MSS is the associated respiratory problems. Structures in the respiratory system, such as the larynx and trachea, may not function properly because they can be "floppy," soft, and less muscular than usual. Because of this, airways can become plugged or clogged, since air does not move through to clear them like usual. Mucus may start collecting, causing an increased amount of bacteria that can lead to pneumonia. Ear infections are common, because the bacteria can spread to the ears as well. Internal nasal passages may be narrower in people with MSS, which can also pose difficulty with breathing.

## Treatment:

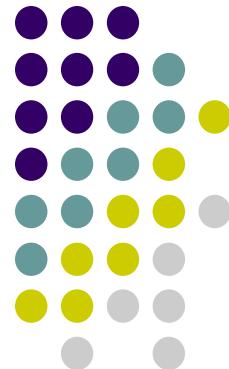
As mentioned earlier, long hospitalizations are common for people with MSS. Most of these involve treating severe respiratory complications of MSS. These types of complications often necessitate placing a tracheotomy to assist with breathing. Manual removal of the mucus buildup by suctioning near the tracheotomy is common. Frequent pneumonia is common, and intravenous antibiotics are often the treatment, as in people without MSS. There is no specific treatment for the advanced bone age.

Because feeding can be difficult for children with MSS, a gastrostomy is often needed, and feeding is done directly through the gastrostomy tube. It is a challenge to make sure children with MSS maintain proper growth, and sometimes a gastrostomy is the only way to achieve this.

## Prognosis:

Marshall-Smith syndrome is considered a childhood condition because affected individuals do not typically survive past childhood. There is no long-term research on the disease due to it being rare and not typically present in adults.

Most children with MSS die in early infancy, often by three years of age, due to severe respiratory complications and infections that may result from them. There have been reports of children surviving until age seven or eight, but these children did not have severe respiratory problems. These children give hope that the condition is variable, and not every person diagnosed with the condition will have a severely shortened lifespan.



# Melnick-Fraser

## (Branchiootorenal Syndrome)

### Summary:

Branchiootorenal (BOR) syndrome is an autosomal dominant condition characterized by ear abnormalities, hearing loss, cysts in the neck, and kidney problems.

### Diagnosis:

The diagnosis of BOR syndrome is made when an individual has the common characteristics associated with the condition. An individual does not need to have all three components of the disorder in order to be diagnosed with the condition.

There is no readily available genetic test that can diagnose BOR syndrome. Some laboratories are performing DNA testing for mutations in the EYA1 gene, however, this testing is currently being offered on a research basis only. Individuals interested in this type of testing should discuss it with their doctor.

### Signs and Symptoms:

The characteristics associated with BOR syndrome are highly variable. Some individuals with BOR syndrome have many physical deformations. Other individuals with BOR syndrome have a few minor physical differences. The birth defects can occur on only one side of the face (unilateral) or be present on both sides (bilateral).

Abnormal development of the ears is the most common characteristic of BOR syndrome. The ears may be smaller than normal (microtia) and may have an unusual shape. Ear tags (excess pieces of skin) may be seen on the cheek next to the ear. Preauricular pits (small pits in the skin on the outside of the ear) are found in 75% of patients with BOR syndrome. Hearing loss is present in 85% of individuals with BOR syndrome and this loss may be mild or severe.

The most distinctive finding in individuals with BOR syndrome is the presence of cysts or fistulas in the neck region due to abnormal development of the branchial arches. These cysts and fistulas can be filled with or discharge fluid.

Approximately two-thirds of individuals with BOR syndrome also have kidney abnormalities. These abnormalities can be very mild and cause no health problems, or they can be very severe and life threatening. The kidneys can be smaller than normal (renal hypoplasia), abnormally shaped, malfunctioning, or totally absent (renal agenesis).

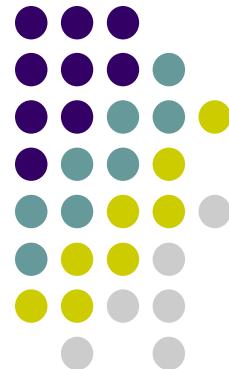
Other less common characteristics associated with BOR syndrome include cleft palate, facial nerve paralysis, and abnormalities of the tear ducts. The tear ducts (lacrimal ducts) may be absent or abnormal. Some patients with BOR syndrome uncontrollably develop tears while chewing (gustatory lacrimation).

### Treatment:

Once a child is diagnosed with BOR syndrome, additional tests should be performed. A hearing evaluation is necessary to determine if there is hearing loss. If hearing loss is evident, the child should be referred to a hearing specialist. Hearing tests may need to be performed on a regular basis. Speech therapy may also be helpful. An ultrasound of the kidney may be necessary, due to the increased risk for birth defects in these areas. Finally, minor surgery may be required to correct the branchial cysts and fistulas commonly found in BOR syndrome.

### Prognosis:

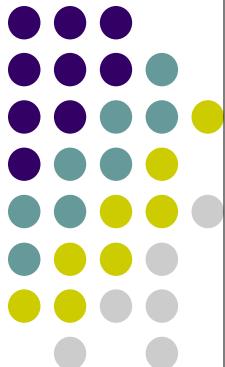
The prognosis for individuals with BOR syndrome is very good. Individuals with BOR syndrome typically have a normal life span and normal intelligence.



# Microdactyly

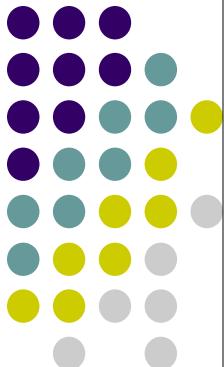
## Summary:

A condition of abnormal smallness of fingers or toes.



# Midas Syndrome

(microphthalmia-dermal aplasia-sclerocornea syndrome)



## Summary:

**Microphthalmia-dermal aplasia-sclerocornea syndrome:** Linear areas of erythematous skin dysplasia involving the chin, neck, and head, occurring in association with microphthalmia, corneal opacities, and orbital cysts. Additional findings may include agenesis of corpus callosum, sclerocornea, chorioretinal abnormalities, hydrocephalus, seizures, mental retardation, and nail dystrophy. Some features of the phenotype of this syndrome overlap those of Aicardi and Goltz syndromes.

# Miller-Dieker Syndrome

## Summary:

Miller-Dieker syndrome (MDS) is a rare [genetic disorder](#). Its signs and symptoms include severe abnormalities in brain development as well as characteristic facial features. Additional birth defects may also be present.

## Diagnosis:

MDS is not the only disorder associated with lissencephaly. Autosomal dominant, autosomal recessive, and X-linked patterns of inheritance have been described among the more than two dozen genetic syndromes featuring this brain [abnormality](#). Less commonly, lissencephaly can also be the result of fetal infections such as prenatal cytomegalovirus (CMV). An accurate diagnosis of MDS is important not only because it can provide a prognosis for the affected child, but because it can give parents an estimate of their risk for having another child with MDS.

MDS may be suspected in the newborn period if an infant has the characteristic facial features along with low muscle tone. Studies of the infant's brain by CAT scan or MRI will show the smooth brain surface. After the diagnosis of MDS is made on the basis of these signs and symptoms, it is very important to study the infant's chromosomes to check for the characteristic chromosome 17 deletion. This is done by sending a small sample of the infant's blood to a cytogenetics laboratory. Trained laboratory personnel (cytogeneticists) first examine the infant's chromosomes through the microscope using traditional techniques. If no deletion or other chromosome rearrangement is detected in this step, newer methods can be used to search for deletions that are too small to see by ordinary means (micro-deletions). A special technique called FISH (fluorescent in situ hybridization) can detect chromosome regions where very small pieces of **DNA** are missing. This test is usually done on the same blood sample.

## Signs and Symptoms:

Infants with MDS are usually small at birth. Characteristic facial features may include a high forehead with furrows and vertical ridges, indentation of the temples, a small, upturned nose, up-slanting eyes, a small mouth, a thick, broad upper lip with a thin border, low-set ears, and occasionally, a [cleft palate](#). Some infants with MDS also have birth defects involving the heart and kidneys. Signs and symptoms can vary among MDS patients. This may relate to the actual size or exact location of the chromosome 17 deletion in that individual.

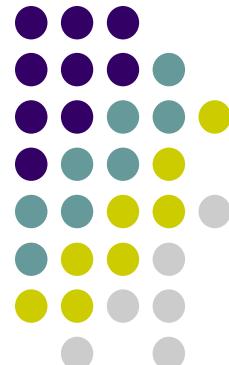
MDS infants have a very limited capacity for development due to the lissencephaly and associated brain abnormalities. [Mental retardation](#) is severe to profound. Infants with MDS may be able to do little more than roll over. Convulsions (seizures) develop within a few weeks of birth and can be severe. Most newborns with MDS have [low muscle tone](#) (hypotonia), but later develop stiffness (spasticity) and an arching of the body (opisthotonos). Poor feeding leads to a [failure to thrive](#) and increases the risk of [pneumonia](#) because the infants can accidentally inhale baby formula into their lungs. Head size is usually in the normal range at birth, but poor brain growth means that, by the age of one year, the children have a smaller-than-normal head size (microcephaly).

## Treatment:

There is no cure for MDS and treatment is usually directed toward comfort measures. Because of the feeding problems and risk of pneumonia, surgeons often place a tube between the stomach and the outside of the abdomen (gastrostomy tube). Feedings can be made through the tube. Seizures are often difficult to control even with medication.

## Prognosis:

Death often occurs in the first three months of life and most infants with MDS die by two years of age, although there have been reports of individuals living for several years.



# Mobius Sequence

## Summary:

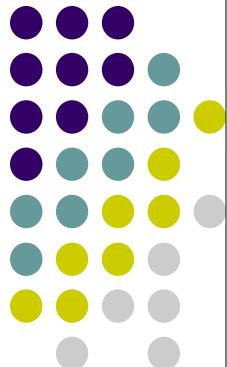
Mobius syndrome is a rare birth defect caused by the absence or underdevelopment of the 6th and 7th cranial nerves, which control eye movements and facial expression. The first symptom, present at birth, is an inability to suck. Other symptoms can include: feeding, swallowing, and choking problems; excessive drooling; crossed eyes; lack of facial expression; inability to smile; eye sensitivity; motor delays; high or cleft palate; hearing problems; and speech difficulties. Small or absent brain stem nuclei that control the cranial nerves, as well as decreased numbers of muscle fibers, have been reported. Deformities of the tongue, jaw, and limbs, such as clubfoot and missing or webbed fingers, may also occur. As children get older, lack of facial expression and inability to smile become the dominant visible symptoms. The prognosis for otherwise normal development is excellent in most cases.

## Treatment:

There is no specific course of treatment for Mobius syndrome. Treatment is supportive and in accordance with symptoms. Infants may require feeding tubes or special bottles to maintain sufficient nutrition. Surgery may correct crossed eyes and improve limb and jaw deformities. Physical and speech therapy often improves motor skills and coordination, and leads to better control of speaking and eating abilities. Plastic reconstructive surgery may be beneficial in some individuals. Nerve and muscle transfers to the corners of the mouth have been performed to provide limited ability to smile.

## Prognosis:

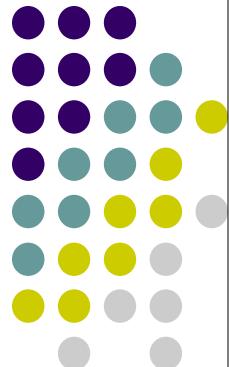
There is no cure for Mobius syndrome. In spite of the impairments that characterize the disorder, proper care and treatment give many individuals a normal life expectancy.



# Mosaic Trisomy 8

## Summary:

Trisomy 8 is defined as the presence of three full copies of **chromosome 8** in all of a person's cells. Mosaic trisomy 8 describes the situation that occurs when only a portion of these cells contains three copies of chromosome 8, while others contain the usual two copies of that chromosome. For example, people with mosaic trisomy 8 may have cells in their blood and other tissues with the normal chromosome number, but may have cells in their skin with trisomy 8. Suspicions about T8mS are usually based on a child being born with unique characteristics, since there usually is no reason one would suspect it, such as a family history of the condition. Blood chromosome testing is widely available to diagnose chromosome abnormalities. If enough cells are carefully analyzed in the laboratory, T8mS can often be found in a blood sample.



## Diagnosis:

In situations where a child with multiple characteristics has normal blood chromosome results, other tissues like the skin can be studied for its chromosome makeup. A trained physician can do a brief procedure called a skin biopsy to obtain a small skin sample. During this, the physician takes a pencil eraser-sized piece of skin from a child's arm or back. Sometimes this testing reveals the presence of **trisomy 18** in skin cells, which would confirm a diagnosis of T8mS.

Many characteristics of T8mS will not be seen during a pregnancy. However, a woman may be offered a routine prenatal chromosome testing for other reasons, such as her age or family history. A chorionic villus sampling (CVS) or **amniocentesis** procedure, done in the first two trimesters of pregnancy, can usually identify trisomy 8. Depending on the number of cells that are carefully studied, T8mS may also be identified.

## Signs and Symptoms:

Characteristics of T8mS vary. In other chromosome mosaicism conditions, more severe symptoms and a worse prognosis are associated with a larger proportion of cells with an abnormal chromosome number being present. Interestingly, that does not seem to be the case in T8mS. The percentage of cells with trisomy 8 does not appear to correlate with the types of symptoms the affected person experiences.

The creases on the palms and soles of people with T8mS are the most unique characteristic of the condition. On the palms there may be more arches than usual on the fingertips and a single crease running across the palm. The creases are often deep and vertical, with a furrowed appearance, on the soles of the feet.

People with T8mS often have distinct facial characteristics. This can include a wide upturned nose, thicker and downturned lower lip, and low-set and prominent ears that may not be shaped in the usual way. They may also have abnormalities of the palate, including a cleft (opening) or highly arched palate.

Mental retardation can occur with the condition, and the degree of mental delays varies from mild to moderate.

Other findings in T8mS can include those of the bone and tissues. These may be narrow shoulders, absent knee caps, abnormally shaped toes, tighter joints, slender palms, extra or missing ribs, and curving of the spine.

Eye abnormalities are seen in T8mS, and the two most common findings are corneal clouding and strabismus where an eye turns in. These may or may not cause significant vision problems and require treatment. More rare eye problems can include a smaller eye size, smaller eye openings, droopy eyelids, wide-set eyes, tilted optic discs, nearsightedness, retinal abnormalities, and epicanthic folds.

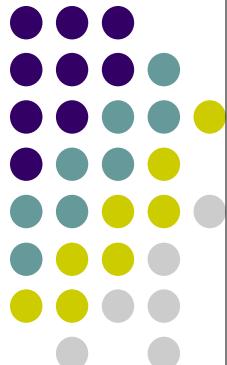
## Prognosis:

People with T8mS have a prognosis that is entirely dependent upon the symptoms they experience. Someone born with a severe congenital heart defect may have a poorer prognosis for survival, growth, and development based on this. The average lifespan for someone with the T8mS is estimated to be near normal in the literature. Medical treatments and surgeries continue to offer hope.

# MPS (mucopolysaccharidosis)

## Summary:

Mucopolysaccharidosis (MPS) is a general term for a number of inherited diseases that are caused by the accumulation of mucopolysaccharides, resulting in problems with an individual's development. With each condition, mucopolysaccharides accumulate in the cells and tissues of the body because of a deficiency of a specific enzyme. The specific enzyme that is deficient or absent is what distinguishes one type of MPS from another. However, before these enzymes were identified, the MPS disorders were diagnosed by the signs and symptoms that an individual expressed. The discovery of these enzymes resulted in a reclassification of some of the MPS disorders. These conditions are often referred to as MPS I, [MPS II](#), MPS III, [MPS IV](#), MPS VI, MPS VII, and MPS IX. However, these conditions are also referred to by their original names, which are Hurler, Hurler-Scheie, Scheie (all MPS I), Hunter (MPS II), Sanfilippo (MPS III), Morquio (MPS IV), Maroteaux-Lamy (MPS VI), Sly (MPS VII), and Hyaluronidase deficiency (MPS IX).



## Diagnosis:

While a diagnosis for each type of MPS can be made on the basis of the physical signs described above, several of the conditions have similar features. Therefore, enzyme analysis is used to determine the specific MPS disorder. Enzyme analysis usually cannot accurately determine if an individual is a carrier for a MPS condition. This is because the enzyme levels in individuals who are not carriers overlaps the enzyme levels seen in those individuals who are carrier for a MPS. With many of the MPS conditions, several mutations have been found in each gene involved that can cause symptoms of each condition. If the specific mutation is known in a family, **DNA** analysis may be possible.

Once a couple has had a child with an MPS condition, prenatal diagnosis is available to them to help determine if a fetus is affected with the same MPS as their other child. This can be accomplished through testing samples using procedures such as an [amniocentesis](#) or [chorionic villus sampling](#) (CVS). Each of these procedures has its own risks, benefits, and limitations.

## Causes and Symptoms:

Each type of MPS is caused by a deficiency of one of the enzymes involved in breaking down GAGs. It is the accumulation of the GAGs in the tissues and organs in the body that cause the wide array of symptoms characteristic of the MPS conditions. The accumulating material is stored in cellular structures called lysosomes, and these disorders are also known as lysosomal storage diseases.

## Treatment:

There is no cure for mucopolysaccharidosis, however, several types of experimental therapies are being investigated. Typically, treatment involves trying to relieve some of the symptoms. For MPS I and VI, [bone marrow transplantation](#) has been attempted as a treatment option. In those conditions, bone marrow transplantation has sometimes been found to help slow down the progression or reverse some of symptoms of the disorder in some children. The benefits of a bone marrow transplantation are more likely to be noticed when performed on children under two years of age. However, it is not certain that a bone marrow transplant can prevent further damage to certain organs and tissues, including the brain. Furthermore, bone marrow transplantation is not felt to be helpful in some MPS disorders and there are risks, benefits, and limitations with this procedure. In 2000, ten individuals with MPS I received recombinant human alpha-L-iduronidase every week for one year. Those individuals showed an improvement with some of their symptoms. Additionally, there is ongoing research involving gene replacement therapy (the insertion of normal copies of a gene into the cells of patients whose gene copies are defective).

# MSUD (maple syrup urine disease)

## Summary:

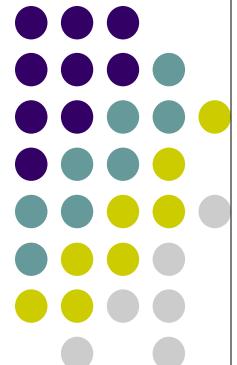
[Maple syrup urine disease](#) is an inherited disease of [amino acid](#) metabolism that causes acidosis, central nervous system symptoms, and urine that may smell sweet like maple syrup.

## Causes:

Maple syrup urine disease (MSUD) is caused by the inability to metabolize the branched-chain amino acids leucine, isoleucine, and valine. The disease is called MSUD because urine from affected people smells like maple syrup.

In the most severe form, MSUD causes severe acidosis during the first week of life. This is characterized by progressively poorer feeding, [vomiting](#), seizures, lethargy, and finally [coma](#).

Untreated infants may die in the first few weeks of life in severe forms of the disease. MSUD also occurs in an intermittent form and a mild form. Even in the mildest form, infections can cause [mental retardation](#) and bouts of acidosis.



## Signs and Symptoms:

- Family history of MSUD or unexplained infant death
- Urine that smells like maple syrup
- Feeding difficulties
- Lethargy
- Vomiting
- Seizures
- Coma
- Avoiding food
- Urine amino acids (elevated levels of the amino acids leucine, isoleucine, and valine)
- Plasma amino acids (elevated levels of leucine, isoleucine, and valine)
- [Ketosis](#) (elevated levels of ketone bodies in urine and plasma)
- Acidosis (excess acid in blood)

## Treatment:

Treatment of the acute episode:

- Acute acidosis is treated to restore normal pH.
- Because this is a protein intolerance disease, protein is cut from the diet.
- High doses of intravenous fluid, sugar and fat are given to prevent [dehydration](#) and provide energy to stimulate protein synthesis, which lowers the levels of the amino acids that cannot be broken down.
- [Peritoneal dialysis](#) or [hemodialysis](#) are used to remove the high levels of amino acids.
- A special diet free of branched-chain amino acids is started immediately.

Long range treatment requires a special diet. Strict compliance is necessary to prevent neurological damage. This requires close supervision by a registered [dietitian](#) and a physician, and parental cooperation. The diet includes a synthetic infant formula with low levels of the amino acids leucine, isoleucine, and valine.

Frequent blood testing for amino acid levels allows doctors and dieticians to adjust the balance of these branched-chain amino acids so that they are neither deficient nor in excess. Affected people must remain on this diet permanently.

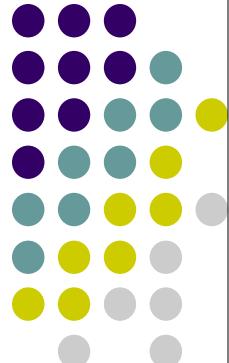
## Prognosis:

If left untreated, life-threatening neurological damage may result. Even with dietary treatment, stressful situations and illness can still cause bouts of acidosis. Death may occur during these episodes. With strict dietary treatment, children have grown into healthy adulthood.

# Myelodysplasia

## Summary:

Myelodysplastic syndrome (MDS) is a disease that is associated with decreased production of blood cells. Blood cells are produced in the bone marrow, and the blood cells of people with MDS do not mature normally. There are three major types of blood cells—red blood cells, white blood cells and platelets. Patients with MDS can have decreased production of one, two, or all three types of blood cells.



## Causes:

There is no clear cause for the majority of MDS cases, which is referred to as primary or *de novo* myelodysplastic syndrome. In some cases, however, MDS results from earlier **cancer** treatments such as radiation and/or **chemotherapy**. This type of MDS is called secondary or treatment related MDS, is often seen 3 to 7 years after the exposure, and usually occurs in younger people.

Other possible causative agents for MDS include exposure to radiation, cigarette smoke or toxic chemicals such as benzene. Children with pre-existing chromosomal abnormalities such as **Down syndrome** have a higher risk of developing MDS. MDS does not appear to run in families, nor can it be spread to other individuals.

## Symptoms:

MDS symptoms are related to the type of blood cells that the body is lacking. The earliest symptoms are usually due to anemia, which results from a shortage of mature red blood cells. Anemia causes patients to feel tired and out of breath because there is a lack of cells transporting oxygen throughout the body. MDS may also lead to a shortage of white blood cells resulting in an increased likelihood of infections. Another symptom of MDS is increased bleeding (e.g. **blood in stool**, nose bleeds, increased **bruises** or bleeding gums) which is due to a low level of platelets. These symptoms can occur in any combination, depending on a given patient's specific subtype of MDS.

## Prognosis:

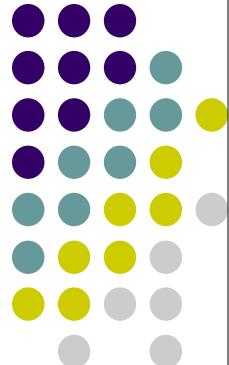
The prognosis for MDS patients depends on the sub-type of their disease and the IPSS score. Patients with RA, RARS or low IPSS score rarely develop leukemia and may live with disease for some years. The higher-risk patients including those with RAEB, RAEBt, CMMoL or high IPSS scores progress more rapidly, and require intensive therapy to control the disease.

Managing MDS requires frequent doctor appointments to monitor disease progression and to evaluate the response to treatment. Fortunately for many patients, recent advances in therapy have significantly enhanced their ability to cope with MDS. Experimental drugs and a better understanding of the disease are likely to improve the overall prognosis in the future.

# Myotonic Dystrophy

## Summary:

Myotonic dystrophy is an inherited disorder that affects muscle tone, and [hair loss](#) and can involve varying degrees of impaired cognitive abilities. It is inherited as a dominant disorder, which means that individuals that carry the defective gene have the disease. The amount of symptoms exhibited



## Causes and Symptoms:

Myotonic dystrophy involves many different tissues within the body, including the eye, the heart, the endocrine system, and the **central nervous system**. The clinical manifestations in myotonic dystrophy span from mild to severe, leading to three separate categories with somewhat overlapping characteristics: mild, classical, and congenital (in which the clinical manifestations are evident at birth).

## Diagnosis:

Myotonic dystrophy is diagnosed clinically in individuals that have a specific type of muscle weakness. This is confirmed with molecular [genetics](#) testing, where the DMPK is analyzed. This gene is located on chromosome 19q13.2-13.3. Within the gene, there is a DNA sequence that is a string of three letters in the DNA alphabet (GTC, which are abbreviations for the nucleotides guanine, thymine, and cytosine) that are normally repeated up to 37 times. CTG repeats repeated greater than 50 times alters the function of the protein and can lead to disease. Individuals that have repeats from 38–49 times are considered to have permutations and in this range they generally do not produce symptoms, but their children are at risk for having repeats that expand into the disease causing range. Patients have more symptoms when they have repeat sizes greater than 50. DNA testing is 100% sensitive (able to determine the defect) and widely available. Prenatal diagnosis to determine if a fetus is affected is also available.

Myotonic dystrophy is suspected by physicians if patients experience muscle weakness in the lower legs, hands, neck, and face. They will experience a characteristic sustained muscle contraction whereby they have difficulty in quickly releasing their hand grip during a handshake. They also develop cataracts. Newborns usually have generalized and facial muscle weakness, [club foot](#), and respiratory difficulties. Their muscles usually appear hypotonic (floppy).

## Treatment:

There is no specific treatment that has been identified to help the muscle weakness or prevent muscle wasting in myotonic dystrophy. Ankle and/or leg braces can be used to help support the muscles as the disease worsens. Heart problems, cataracts, and other abnormalities can often be treated. There are also medications that can help relieve the

## Prognosis:

The prognosis for patients that are diagnosed with the mild form of the disease is quite good. They usually do not have mental retardation and can live a close to normal lifespan. Affected individuals that have the classic form have a more severe prognosis. They have more clinical manifestations and lifespan usually ranges 48–55 years. The congenital form is the most severe, although patients live, on average, until they are 45 years old. They have more severe mental retardation, respiratory deficits, and have clinical manifestations at birth.

# Myotubular Myopathy

## Summary:

Myotubular [myopathy](#) (MTM) belongs to a rare group of developmental disorders of voluntary muscle called congenital myopathies that present as a "floppy baby" syndrome. This is a genetically inherited disorder with various abnormalities in muscle fiber development, muscle tone, and contraction. MTM refers to the pathological finding of muscle fibers with centrally located nuclei resembling the myotubule stage of muscle development.

## Signs and Symptoms:

There is a wide spectrum of clinical features seen in MTM depending on the mode of inheritance, but the basic problem arises from [poor muscle tone](#) interfering with posture, locomotion, and muscle strength. In general, the earlier the symptoms present, the more severe and progressive is the disorder.

## Diagnosis:

There is a considerable overlap in symptom severity among the three forms of MTM in affected males. Thus, in a family with a single affected male child, reliance on clinical features alone to diagnose the pattern of inheritance, to predict its prognosis, and to counsel the family regarding the chance of having another affected child becomes difficult. Detailed and thorough family history should be obtained to detect other family members with possible MTM. There is no absolute biochemical, **DNA**, or [pathology](#) test that can tell conclusively the pattern of inheritance in an isolated case. A history of spontaneous abortions or death of male infants in the neonatal period is a clue to X-linked transmission.

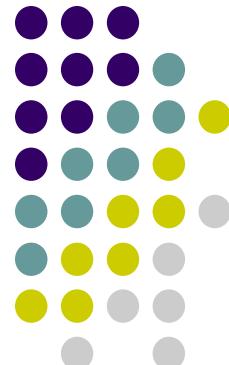
Creatine kinase (CK) is an enzyme that indicates muscle breakdown and can be normal or slightly increased. Electromyography (EMG), which involves needle testing of muscle activity, can point to a myopathy without being specific for MTM. [Muscle biopsy](#) is diagnostic, whereby a piece of muscle from the thigh or arm is taken and studied under the microscope to highlight the typical central plump nuclei in muscle fibers. The diagnosis depends on demonstrating a large number of muscle fibers with centrally placed nuclei. In X-linked MTM, all muscles are equally affected and about 50–80% of the muscle fibers are abnormal. Muscle biopsy can detect 50–70% of female carriers of X-linked MTM, but the biopsy can also be normal.

## Treatment:

As of 2005, there is no proven treatment to cure or stop progression of MTM, but aggressive supportive measures for swallowing and breathing are warranted to preserve good functional ability as these have been shown to prolong life expectancy. A team approach, including a [neurologist](#), pulmonologist, [orthopedic](#) surgeon, physiatrist, [physical therapist](#), occupational therapist, and geneticist, ensures the best possible therapy.

## Prognosis:

Only males are severely affected by X-linked MTM and prognosis has been historically poor due to early respiratory failure. The children lack enough strength and endurance in the respiratory muscles to withstand respiratory complications, such as infections and [lung collapse](#). Death used to occur within one to two years of life, with a mean of five months. Respiratory weakness and frequent pneumonias indicate poor prognosis. Today, with interventions like ventilators and tracheostomy tubes, these complications are delayed and survival is prolonged. Currently, more than two-thirds of children with MTM survive past the first year of life. In X-linked MTM, contrary to prior thinking, the muscle weakness does not appear to be progressive. Children with autosomal recessive MTM usually survive past infancy. Those with autosomal dominant MTM even survive into late adulthood, and the disease is compatible with a normal life expectancy.



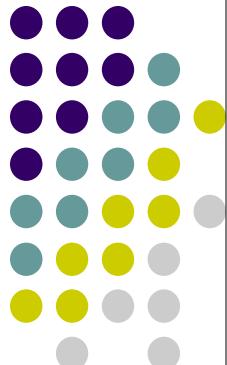
# Neural Tube Defects

## Summary:

Neural tube defects are a group of severe birth defects in which the brain and spinal cord are malformed and lack the protective skeletal and soft tissue encasement.

## Diagnosis:

At birth, the diagnosis is usually obvious based on external findings. Prenatal diagnosis may be made with [ultrasound](#) examination after 12-14 weeks of pregnancy. Screening of pregnancies can be carried out at 16 weeks by testing the mother's blood for the level of alpha-fetoprotein. Open neural tube defects leak this fetal chemical into the surrounding amniotic fluid, a small portion of which is absorbed into the mother's blood.



## Signs and Symptoms:

Because of the faulty development of the spinal cord and nerves, a number of consequences are commonly seen in spina bifida. As a rule, the nerves below the level of the defect develop in a faulty manner and fail to function, resulting in [paralysis](#) and loss of sensation below the level of the spinal lesion. Since most defects occur in the lumbar region, the lower limbs are usually paralyzed and lack normal sensation. Furthermore, the bowel and bladder have inadequate nerve connections, causing inability to control bladder and bowel function. Sexual function is likewise impaired. [Hydrocephaly](#) develops in most infants either before or after surgical repair of the spine defect.

In anencephaly, the brain is destroyed by exposure during intrauterine life. Most infants with anencephaly are stillborn, or die within the initial days or weeks after birth.

Infants with encephaloceles have variable neurologic impairments depending on the extent of brain involvement. When only the brain covering is involved, the individual may escape any adverse effect. However, when the brain is involved in the defect, impairments of the special senses such as sight, hearing, and cognitive thinking commonly result.

## Treatment:

No treatment is available for anencephaly. Aggressive surgical and medical management has improved survival and function of infants with spina bifida. Surgery closes the defect, providing protection against injury and infection. A common complication that may occur before or after surgical correction is the accumulation of excessive cerebral spinal fluid (hydrocephaly) in the major cavities (ventricles) within the brain. Hydrocephaly is usually treated with the placement of a mechanical shunt, which allows the cerebral spinal fluid from the ventricles to drain into the circulation or another body cavity. A number of medical and surgical procedures have been used to protect the urinary system as well. Walking may be achieved with [orthopedic](#) devices. Encephaloceles are usually repaired by surgery soon after birth. The success of surgery often depends on the amount of brain tissue involved in the [encephalocele](#).

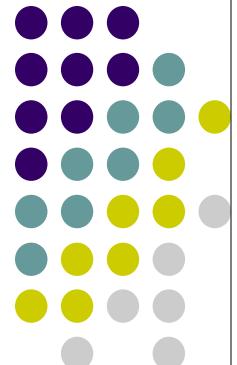
## Prognosis:

Infants with anencephaly are usually stillborn or die within the initial days of life. Eighty to ninety percent of infants with spina bifida survive with surgery. Paralysis below the level of the defect, including an inability to control bowel and bladder function, and hydrocephaly are complications experienced by most survivors. Intellectual function is normal in most cases.

The prognosis for infants with encephaloceles varies considerably. Small encephaloceles may cause no disability whether surgical correction is performed or not. Infants with larger encephaloceles may have residual impairment of vision, hearing, nerve function, and intellectual capacity.

# Opitz Syndrome

**Summary:** First reported as two separate disorders, the G syndrome and the BBB syndrome, the condition is now considered a single entity with a wide clinical variability, ranging from neonatal lethality to an asymptomatic form. Widely-spaced inner ocular canthi and hypospadias as the major features of this syndrome. Associated disorders may include craniofacial anomalies, congenital heart defects, laryngotracheal disorders with dysphagia and aspiration, developmental delay, and other abnormalities. Most symptoms occur in both genetically determined forms, except for anteverted nares and posterior pharyngeal cleft which are found only in X-linked families. The acronym BBB stands for the initials of the last names of each of the three originally reported families. Opitz described the G syndrome, also named after the affected family, consisting of apparent hypertelorism, mild downslanting of the palpebral fissures, epicanthal folds, hypospadias, and laryngotracheoesophageal defects.



**Head and neck:** Mild micrognathia, cranial asymmetry, brachycephaly, prominent forehead, open fontanelles, prominent metopic suture, and occipital and parietal prominences.

**Ears:** Mild posterior rotation of the pinnae and abnormal modeling of the helix.

**Eyes:** Hypertelorism, telecanthus, upslanting or downslanting palpebral fissures, and strabismus. Relative entropion of the lower eyelids may be present.

**Nose:** Elevated or flattened bridge with anteverted nostrils grooved nasal tip, flat philtrum, and epicanthal folds.

**Mouth and oral structures:** Cleft palate and cleft lip, fused and supernumerary teeth, malocclusion, broad or bifid uvula, ankyloglossia, bifid tongue, and short lingual frenulum.

**Abdomen:** Inguinal hernia.

**Hand and foot:** Occasional pes cavus.

**Skin appendages:** Widow's peak and occasional low scalp line.

**Nervous system:** Midline brain anomalies and agenesis of corpus callosum.

**Cardiovascular system:** Atrial septal defect, ventricular septal defect, patent ductus arteriosus, vascular ring, teratology of Fallot, coarctation of aorta, anomalous venous return, and midline position of the heart.

**Respiratory system:** Respiratory distress, stridor, aspiration pneumonia, atelectasis, emphysema, and bronchiectasis are frequently present. Autopsy findings may include tracheal malformations, hypoplasia of the vocal cords, lung hypoplasia, and deformities of the larynx, epiglottis, larynx, and tracheal rings.

**Gastrointestinal system:** Malformations of the upper digestive tract, esophageal motility disorders, and imperforate or ectopic anus.

**Urogenital system:** Hypospadias with various degrees of severity, kidney abnormalities, ureteral stenosis, and cryptorchidism.

**Growth and development:** Intelligence is usually normal but mild mental retardation may occur.

**Behavior and performance:** Breathing, eating (dysphagia), and speaking difficulties.

# Optic Nerve Atrophy

## Summary:

Optic nerve atrophy involves tissue death of the nerve that carries the information of vision from the eye to the brain.

## Causes:

There are many unrelated causes of optic atrophy. The most common cause is poor blood flow, called ischemic [optic neuropathy](#), which most often affects the elderly. The optic nerve can also be damaged by shock, various toxic substances, radiation, and trauma.

Various eye diseases, most commonly [glaucoma](#), can also cause optic nerve atrophy. In addition, the condition can be caused by diseases of the brain and central nervous system, such as [cranial arteritis](#) (sometimes called temporal arteritis), [multiple sclerosis](#), [brain tumor](#), and [stroke](#).

There are also several rare forms of hereditary optic nerve atrophy that affect children and young adults.

## Signs and Symptoms:

Optic nerve atrophy causes dimming of vision and reduction of the field of vision. The ability to see fine detail will also be lost. The pupil reaction to light will diminish and may eventually be completely lost.

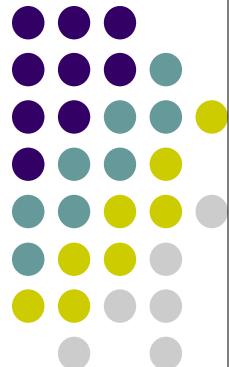
Optic nerve atrophy can be readily detected on complete examination of the eyes. Seeking the cause may require a complete [physical examination](#) and specific tests.

## Treatment:

Once it has occurred, damage from optic nerve atrophy cannot be reversed. The underlying disease must be found and treated if possible to prevent further loss.

## Prognosis:

Vision lost to optic nerve atrophy cannot be recovered. If the cause can be identified and controlled, further [visual loss](#) progressing to [blindness](#) may be prevented.

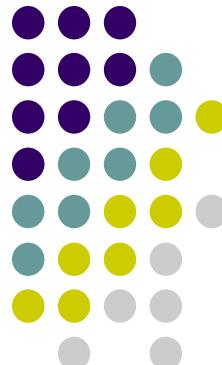


# Ornithine-carbamyl-transferase deficiency

## Summary:

Ornithine transcarbamylase (OTC) deficiency is a rare genetic disorder characterized by complete or partial lack of the enzyme ornithine transcarbamylase (OTC). OTC is one of six enzymes that play a role in the break down and removal of nitrogen from the body, a process known as the urea cycle. The lack of the OTC enzyme results in excessive accumulation of nitrogen, in the form of ammonia (hyperammonemia), in the blood. Excess ammonia, which is a neurotoxin, travels to the central nervous system through the blood, resulting in the symptoms and physical findings associated with OTC deficiency. Symptoms include vomiting, refusal to eat, progressive lethargy, and coma. OTC deficiency is inherited as an X-linked recessive trait.

The urea cycle disorders are a group of rare disorders affecting the urea cycle, a series of biochemical processes in which nitrogen is converted into urea and removed from the body through the urine. Nitrogen is a waste product of protein metabolism. Failure to break down nitrogen results in the abnormal accumulation of nitrogen, in the form of ammonia, in the blood.



## Synonyms of Ornithine Transcarbamylase Deficiency

- Hyperammonemia Type II
- Hyperammonemia due to Ornithine Transcarbamylase Deficiency
- OTC Deficiency
- Ornithine Carbamyl Transferase Deficiency

# Osteogenesis Imperfecta

## Summary:

Osteogenesis imperfecta is a congenital (present from birth) condition of abnormal fragility of the bones.

## Causes:

This [bone disorder](#) is usually present at birth as an inherited disease. Osteogenesis imperfecta (OI) is classified into four major types (and further subtypes). All four types of OI are caused by defects in the amount or structure of type 1 collagen, an important part of the bone matrix. The collagen problem usually results from a dominant genetic defect. This defect may be acquired by several different mechanisms:

- The defect may be inherited in an autosomal dominant pattern from an affected parent. This means that a parent with a single gene for OI has a 50% chance of having a child with the disorder. Any child who inherits this gene will be affected.
- The defect may be acquired by a spontaneous mutation occurring in the individual egg or sperm that formed the child. In this case, neither parent carries a gene for the disorder or is affected by it. The parents, in this case, are no more at risk than the general population for having another child with the disorder.
- The defect may be acquired through a pattern of inheritance called mosaicism. This occurs when neither parent is affected, but one carries a percentage of sperm or eggs which contain the genetic defect. Therefore, though the parents are unaffected, some of their children may have the disorder and others will not. It is estimated that about 2% to 7% of unaffected parents who have had a child with OI will have another child with OI due to the phenomenon of mosaicism.

## Signs and Symptoms:

All of the bones are abnormally weak in a person with OI. The severity of the [abnormality](#) varies enormously -- from type 2 OI, which is usually lethal in infancy (or even before birth) to type 1 OI, which may be so mild that the diagnosis is not made, even in adulthood.

The three classic symptoms of OI include fragile bones, early [hearing loss](#), and whites of the eyes that appear bluish (blue sclerae). Nevertheless, not all people with OI will have [blue](#) sclerae or hearing loss. All do have fragile bones, but not all people with OI will ever break a bone.

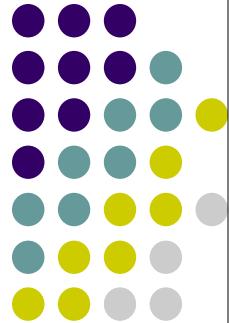
A variety of other symptoms may be found in the various types of OI:

- Bone Fracture (broken bone)
  - More than one broken bone occurring in a single episode (multiple)
  - Fractures present at birth
  - Occurring after only minor trauma
- Deformed or short extremities (such as leg deformities or arm deformities)
- Deafness (conductive hearing loss may occur in adolescents and adults)
- Kyphosis
- Kyphoscoliosis
- [Short stature](#)
- Tooth abnormalities
- Low nasal bridge
- Pectus carinatum
- [Pectus excavatum](#)
- Pes planus (flat feet)
- [Joint laxity](#)
- Hypermobility
- Easy bruising
- Bowed legs

## Prognosis:

Permanent deformity of the extremities may occur. Brain damage may result from skull fractures. The disorder can be fatal. The disease is grouped by type:

- Type 1 - Mild -- Compatible with normal life expectancy.
- Type 2 - Lethal -- Most, but not all, die in early childhood.
- Type 3 - Progressive deforming -- Decreased life expectancy.
- Type 4 - Moderately severe -- Compatible with normal life expectancy.



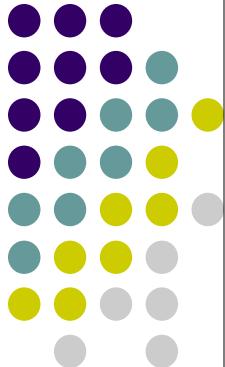
# Pachygryria

## Summary:

**Pachygryria** (from the [Greek](#) "pachy" meaning "thick" or "fat" gyri) is a congenital malformation of the cerebral hemisphere. It results in unusually thick convolutions of the [cerebral cortex](#). Typically, children have developmental delay and [seizures](#), the onset and severity depending on the severity of the cortical malformation. [Infantile spasms](#) are common in affected children, as is intractable [epilepsy](#).

Pachygryria, lissencephaly (smooth brain), and polymicrogyria (multiple small gyri) are all the results of abnormal cell migration. The abnormal migration is typically associated with a disorganized cellular architecture, failure to form six layers of cortical neurons (a four-layer cortex is common), and functional problems. The abnormal formation of the brain may be associated with seizures, developmental delay, and mental dysfunctions.

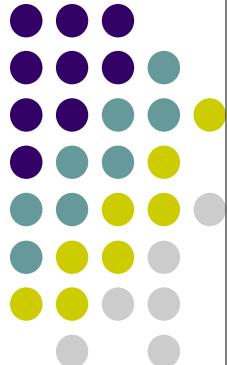
Normally, the brain cells begin to develop in the periventricular region (germinal matrix) and then migrate from medial to lateral, to form the cerebral cortex.



# Pallister-Killian Syndrome

## Summary:

Pallister-Killian syndrome (PKS) is a rare **chromosome abnormality** in which a person has four copies of the short arm of chromosome 12 instead of the normal two copies. Affected individuals have unusual facial features, **mental retardation**, seizures, patchy color differences in the skin, and various other physical abnormalities. Many fetuses with Pallister-Killian syndrome die during pregnancy or soon after birth.



## Diagnosis:

Pallister-Killian syndrome may be suspected from a person's physical features, but a diagnosis requires that a person has the characteristic chromosome abnormality, tetrasomy 12p. PKS is different from many types of chromosomal syndromes in that the causative chromosome abnormality is not found from chromosome studies on the blood. Chromosome **testing on skin** cells will show the characteristic chromosome abnormality in at least some of the cells. It is believed that the characteristic chromosome abnormality, the isochromosome 12p, does not show up in the blood cells because the abnormal isochromosome is lost in the rapid cell division that creates these blood cells. Diagnosis of Pallister-Killian syndrome has traditionally required a **skin biopsy**, but recent reports indicate that the diagnosis can be made using cells scraped from the inside the cheek.

Many cases of PKS may be diagnosed prenatally. Pallister-Killian syndrome is detectable by **amniocentesis**, a routine test offered in pregnancies suspected to be at risk for chromosome problems. Pallister-Killian syndrome may be suspected when certain physical abnormalities are detected on an **ultrasound** during pregnancy. In pregnancies where Pallister-Killian syndrome has been diagnosed in an unborn baby, many ultrasounds have shown an increased amount of fluid around the baby, in addition to other physical abnormalities, including short arms and legs, heart malformations, diaphragmatic hernia, **cystic hygroma**, and unusually flat profile of the face.

## Signs and Symptoms:

Many infants with more severe physical defects associated with PKS will die in utero or shortly after birth. Other persons with Pallister-Killian syndrome have lived at least into their 20s. All persons with PKS have some level of mental retardation or **developmental delay**.

The features of PKS may vary significantly between affected persons. The most typical person with Pallister-Killian syndrome will have profound mental retardation, delayed development, lack of muscle tone, light- and/or dark-colored areas of skin, lack of scalp hair above the temples, and unusual facial features. The facial features characteristic for Pallister-Killian syndrome include a large forehead, widely spaced eyes with vertical folds of skin at the inner corners, droopy eyelids, short and upturned nose, full cheeks, lengthened distance between the nose and upper lip, and small chin.

## Treatment:

There is no treatment or cure for PKS, or for the mental retardation and developmental delays associated with this syndrome. Persons with PKS are treated for the symptoms they display. Individuals with Pallister-Killian syndrome will often take medications for seizures; some may have surgeries due to birth defects involving the diaphragm, intestines, anus, kidneys, genitals, or heart. **Physical therapy** and **occupational therapy** may be helpful for development of muscle tone and reduction of joint fixation.

## Prognosis:

Many infants with PKS die before they are born (in utero) or soon after birth. Some affected individuals reaching their 20s have been reported. Many have severe to profound mental retardation and very few self-care skills. A few reports have described affected persons with milder intellectual impairment.

# Pathologic Head Growth

## Microcephaly:

A [birth defect](#) characterized by an abnormally small head, a receding forehead, and large ears and nose. The condition often signals an abnormally small brain and the presence of other disorders such as [cerebral palsy](#).

[Microcephaly](#) can be caused by genetic and chromosomal abnormalities, or by environmental factors such as prenatal radiation exposure, prenatal infections (**rubella**, toxoplasmosis), and maternal [drug](#) use. Women with [phenylketonuria](#) (PKU) who do not maintain a low-[protein diet](#) during pregnancy are also at risk for having babies with microcephaly.

Microcephaly is occasionally obvious at birth, particularly if the fontanelle, or soft [spot](#), is closed. It is typically diagnosed by measuring the circumference of the baby's head. Sometimes this measurement can be taken in utero through [ultrasound](#) waves. The child's physical growth is usually retarded, and he or she suffers delays in speech and mental development. Some children have seizures, crossed eyes, and spastic [paralysis](#).

The treatment for a microcephalic child is essentially therapeutic, depending on the attending disabilities. The parents may need to learn special feeding techniques if the child's swallowing techniques are underdeveloped. [Physical therapy](#) can improve the child's coordination and strengthen or relax the muscles. **Seizures** and involuntary movements can be prevented by drugs such as anticonvulsants and muscle relaxers. Wheelchairs and [orthopedic](#) devices can aid mobility. Speech therapy can help the child to overcome communication difficulties.

## Macrocephaly:

Also called macrocephalia and megalcephaly, macrocephaly is diagnosed when the circumference of the head is more than two standard deviations above average for the child's age, sex, race, and period of gestation. The fontanelle (soft spot) of the newborn is wide, but facial features are usually normal. Macrocephaly is distinguished from [hydrocephalus](#) in that there is no increase in pressure within the head; however, hydrocephalus can result in macrocephaly in some children. The disorder can result from a defect in formation during the embryonic stage, as a result of certain degenerative diseases, as a part of various genetic syndromes, or as an inherited **family** trait. Mental deficiency, seizures, and **movement disorders** are common in macrocephalic children.

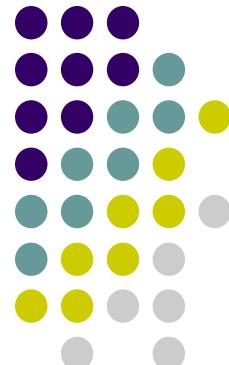
Macrocephaly may be caused by many conditions. The most common causes for an enlarged head are megalencephaly, or an enlarged brain, and hydrocephalus, or excessive cerebrospinal fluid (CSF) in the brain.

When macrocephaly is a result of megalencephaly, it is often impossible to determine the cause. However, megalencephaly is often associated with metabolic diseases such as Canavan's [disease](#) or Alexander's disease or with syndromes such as [gigantism](#), [achondroplasia](#) ([dwarfism](#) or small stature), [osteogenesis imperfecta](#), [neurofibromatosis](#), and some chromosomal anomalies. In each of these disorders, there is an enlargement of brain tissues.

In hydrocephalus, excess CSF collects in the large sections of the brain called the ventricles. This may occur for many reasons, including [Chiari malformation](#), abnormal cysts within the brain, and infections such as [meningitis](#).

In some cases, a child may have benign macrocephaly. In these children, the only [abnormality](#) is an enlarged head. Usually there are other family members with large heads, and the condition is considered a family trait. These children do not have an underlying condition and usually do not have any additional complications.

The major symptom of macrocephaly is an enlarged head circumference. Other symptoms can include, delay in reaching developmental milestones, [mental retardation](#), rapid head growth, and slowed growth of the rest of the body.



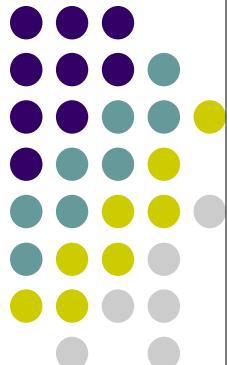
# Perinatal Asphyxia, severe

## Summary:

The clinical diagnosis of perinatal asphyxia is based on several criteria, the two main ones being evidence of cardiorespiratory and neurological depression, defined as an [Apgar score](#) remaining less than 7 at 5 minutes after birth, and evidence of acute hypoxic compromise with acidaemia, defined as an arterial blood pH of less than 7 or base excess greater than 12 mmol/L. [1] In many settings, especially in resource poor countries, it may be impossible to assess fetal or neonatal acidaemia. In the immediate postpartum period when resuscitation is being undertaken, it may not be possible to determine whether the neurological and cardiorespiratory depression is secondary to hypoxia-ischaemia, or to another condition such as foeto-maternal infection or metabolic disease. Consequently, resuscitation and early management will often be of suspected rather than confirmed perinatal asphyxia. [2] [3] [4] This review deals with perinatal asphyxia in [term](#) and [near term](#) newborns.

## Prognosis:

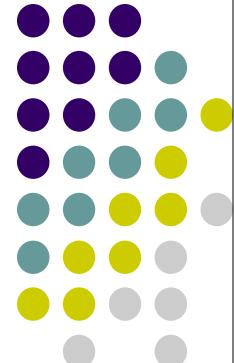
Worldwide, perinatal asphyxia is a major cause of death and of acquired brain damage in newborn infants. [9] The prognosis depends on the severity of the asphyxia. Only a minority of infants with severe encephalopathy after perinatal asphyxia survive without handicap. [5] However, there are limited population based data on long term outcomes after perinatal asphyxia, such as cerebral palsy, developmental delay, visual and hearing impairment, and learning and behavioural problems. After an asphyxial event, there may be an opportunity to intervene to minimise brain damage. The first phase of brain damage, early cell death, results from primary exhaustion of the cellular energy stores. Early cell death can occur within minutes. Immediate resuscitation to restore oxygen supply and blood circulation aims to limit the extent of this damage. A secondary phase of neuronal injury may occur several hours after the initial insult. The mechanisms believed to be important in this process include oxygen free radical production, intracellular calcium entry, and apoptosis. Treatments during the postresuscitation phase aim to block these processes, thereby limiting secondary cell damage and minimising the extent of any brain damage.



# Pervasive Developmental Disorder (ASD)

## Definition:

Pervasive developmental disorders are a group of conditions originating in childhood that involve serious impairment in several areas, including physical, behavioral, cognitive, social, and language development.



## Description:

Pervasive developmental disorders (PDDs) are thought to be genetically based, with no evidence linking them to environmental factors; their incidence in the general population is estimated at 1%. The most serious PDD is **autism**, a condition characterized by severely impaired social interaction, communication, and **abstract thought**, and often manifested by stereotyped and repetitive behavior patterns. Many children who are diagnosed with PDDs today would have been labeled psychotic or schizophrenic in the past.

The handbook used by mental health professionals to diagnose mental disorders such as PDDs is the **Diagnostic and Statistical Manual of Mental Disorders**. The 2000 edition of this manual (fourth edition, text revised) is known as the **DSM-IV-TR**. Published by the American Psychiatric Association, the **DSM** contains diagnostic criteria, research findings, and treatment information for mental disorders. It is the primary reference for mental health professionals in the United States. Besides autism, the **DSM** lists several other conditions as PDDs:

### Rett's Disorder:

Characterized by physical, mental, and social impairment, this syndrome appears between the ages of five months and four years in children whose development has been normal up to that point. Occurring only in girls, it involves **impairment of coordination**, repetitive movements, a slowing of head growth, and severe or profound **mental retardation**, as well as impaired social and communication skills.

### Childhood Disintegrative Disorder

This disorder is marked by the deterioration of previously acquired physical, social, and communication skills after at least two years of normal development. More common in males than females, it first appears between the ages of two and 10 (usually at three or four years of age), and many of its symptoms resemble those of autism. Other names for this disorder are Heller's syndrome, **dementia infantilis**, and disintegrative **psychosis**. It sometimes appears in conjunction with a medical condition such as Schilder's disease, but usually no organic cause can be found.

### Asperger's Disorder

Children with this disorder have many of the same social and behavioral impairments as autism, except for difficulties with language. They lack normal tools of social interaction, such as the ability to meet someone else's gaze, use appropriate body language and gestures, or react to another person's thoughts and feelings. Behavioral impairments include the repetitive, stereo-typed motions and rigid adherence to routines that are characteristic of autism. Like **childhood disintegrative disorder**, **Asperger's disorder** is more common in males than females.

## Prognosis:

In general, the prognosis in each of these conditions is tied to the severity of the illness.

The prognosis for Asperger's syndrome is more hopeful than the others in this cluster. These children are likely to become functional, independent adults, but will always have problems with social relationships. They are also at greater risk for developing serious mental illness than the general population.

The prognosis for **autistic disorder** is not as good, although great strides have been made in recent years in its treatment. The higher the patient's intelligence quotient (IQ) and ability to communicate, the better the prognosis. However, many patients will always need some level of custodial care. In the past, most of these individuals were confined to institutions, but many are now able to live in **group homes** or supervised apartments. The prognosis for childhood disintegrative disorder is the least favorable. These children will require intensive and long-term care.

# Phocomelia

## Summary:

Roberts SC phocomelia is a rare [genetic condition](#) that causes severe abnormalities in arm and leg bones. Other abnormalities, such as [mental retardation](#), may also be present.

## Diagnosis:

This disorder has been diagnosed during pregnancy at 12 weeks, through a test called an [ultrasound](#) evaluation. In these incidences, developmental problems with the growth and formation of both the arms and legs were noted. Sometimes the syndrome cannot be diagnosed by ultrasound until later in the pregnancy, when the limb shortening or absence becomes more obvious, and sometimes it cannot be diagnosed by ultrasound at all.

Other abnormalities that might be seen by ultrasound include cleft lip, increased distance between the eye sockets, and extra fluid in some of the structures of the brain ([hydrocephalus](#)). Excess amniotic fluid levels, kidney problems, and an opening in the spine ([spina bifida](#)) have also been found. However, an exact diagnosis of the syndrome cannot be made by ultrasound evaluation alone.

Checking for the unusual chromosome feature is done through [amniocentesis](#), a procedure that collects the developing fetus's cells for evaluation. But this test is not typically recommended, because not all affected individuals have this chromosome finding. In addition, the chromosome is not always evident in the cells from the amniotic fluid.

As of 2001 there was no accurate prenatal test to diagnose the syndrome during pregnancy.

After a baby is born with characteristics of Roberts SC phocomelia syndrome, a diagnosis can be made through a complete [physical examination](#). In addition, analysis of the baby's chromosomes may also be useful. The chromosomes can be analyzed through a blood or tissue sample.

## Signs and Symptoms:

In the bones of the lower arm (radius and ulna), limb shortening or absence of limbs is evident in approximately 97% of people with the syndrome. The upper arm (humerus) is affected 77% of the time. A missing or shortened thighbone (femur) occurs in about 65% of affected individuals. The bones in the lower leg (tibia and fibula) are shortened or absent in 77% of those with the disorder.

It is often very hard to flex or bend the knees, ankles, wrists, and/or elbows. While the feet and hands are almost always present, there may be fewer than normal fingers and toes, or shortened fingers. Sometimes the fingers are fused together (syndactyly).

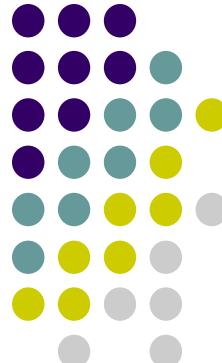
People with the syndrome are smaller than other babies the same age, both before and after birth. Babies with Roberts SC phocomelia syndrome may have thin hair that is often described as silvery in color. In addition, most people with Roberts SC phocomelia syndrome are born with a cleft lip (a failure of the upper lip to close completely) and [cleft palate](#) (an opening in the roof of the mouth). Other abnormalities that may occur include a small and underdeveloped chin, a short neck, heart and kidney problems, prominent and widely spaced eyes, and unusually shaped ears.

## Treatment:

At this time there is no treatment available for individuals with Roberts SC phocomelia syndrome. The shortness or absence of limbs makes it difficult for any type of limb-lengthening therapies to be useful in most instances.

## Prognosis:

The majority of severely affected individuals will die in the womb, or during or shortly after birth. Those who survive will have very obvious growth deficiency as well as mental retardation. Babies who are not as severely affected, with less dramatic limb shortening and no facial cleft, have a better overall prognosis.



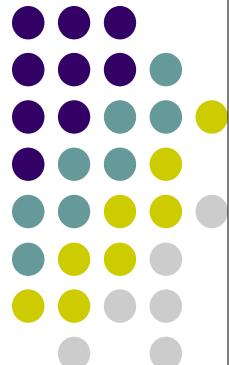
# Phenylketonuria (PKU)

## Summary:

Phenylketonuria (PKU) is a rare hereditary condition in which the [amino acid phenylalanine](#) is not properly metabolized. PKU can cause severe [mental retardation](#) if not treated.

## Causes:

Phenylketonuria (PKU) is inherited as an autosomal recessive trait (both parents must pass on the defective gene for the child to be affected). The genetically-determined [abnormality](#) in phenylketonuria is a missing enzyme called phenylalanine hydroxylase.



## Signs and Symptoms:

- Skin rashes ([eczema](#))
- [Microcephaly](#)
- Tremors
- Jerking movements of the arms or legs ([spasticity](#))
- Unusual hand posturing
- Seizures
- Hyperactivity
- Delayed mental and social skills
- Mental retardation
- A distinctive "mousy" odor to the urine and [sweat](#)
- Light coloration (frequent finding of light complexion, blond hair, and [blue](#) eyes)

## Treatment:

Treatment includes a diet that is extremely low in phenylalanine, particularly when the child is growing. Strict compliance to the diet is necessary to prevent or minimize mental retardation. This requires close supervision by a registered [dietitian](#) or physician, and cooperation of the parent and child.

Phenylalanine occurs in significant amounts in milk, eggs and other common foods. Nutrasweet (aspartame) also contains phenylalanine, and products containing aspartame should be avoided by children with this disorder. A special infant formula called Lofenalac is made for infants with PKU. It can be used throughout life as a protein source that is extremely low in phenylalanine and balanced for the remaining essential amino acids.

Adult women who have PKU and who plan to become pregnant should also adhere to a strict low-phenylalanine diet both before becoming pregnant and throughout the pregnancy.

## Prognosis:

The outcome is expected to be very good if dietary treatment is followed closely beginning shortly after the child's birth. If treatment is started after 3 years, or if the disorder remains untreated, brain damage is inevitable.

# Prader-Willi Syndrome

## Summary:

Prader-Willi syndrome is a congenital (present from birth) disease characterized by obesity, decreased muscle tone, decreased mental capacity, and [hypogonadism](#).

## Causes:

Prader-Willi is caused by the deletion of a gene on chromosome 15. The majority of patients have a deletion of the father's DNA in this region. The remaining patients frequently have two copies of the mother's chromosome 15. The maternal copy of this gene is turned off in all people. When there is a deletion of the father's DNA (approximately 70% of patients), the disease occurs. This is because the patient is left with only the inactive, maternal copy.

Signs of Prader-Willi may be seen at birth. New infants with the condition are often small and very floppy (hypotonic). Male infants may have undescended testicles. The growing child exhibits slow mental and delayed motor development, increasing obesity, and characteristically small hands and feet.

## Symptoms:

- Floppy newborn infant (hypotonic)
- Small for gestational age
- Undescended testicles in the male infant
- Delayed motor development
- Slow mental development
- Very small hands and feet in comparison to body
- Rapid weight gain
- Insatiable appetite, food craving
- Almond-shaped eyes
- Narrow bifrontal skull
- Morbid obesity
- Skeletal (limb) abnormalities
- [Stria](#)

## Signs:

- [Hypotonia](#)
  - Hypomenia
  - Hypogonadism
  - Obesity
- Other signs related to morbid obesity:
- Hypoxia (chronic)
  - Hypercapnia (chronic)
  - Cor pulmonale
  - Hyperinsulinism
  - Abnormal glucose tolerance (see [glucose tolerance test](#))
  - [Orthopedic](#), knee, and hip problems
  - Failure to respond to luteinizing hormone releasing factor
  - Skull and narrow bifrontal diameter

## Treatment:

Obesity represents the greatest problem to health. Limiting caloric intake will control the obesity but the family, neighbors, school, and other institutions must cooperate closely as the child will attempt to obtain food wherever possible. Exercise can increase lean body mass in children with Prader-Willi syndrome.

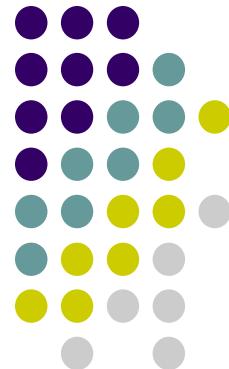
Recent studies have demonstrated benefits of growth hormone treatment in causing accelerated growth and decreasing percent body fat. Growth hormone (GH) has also been shown to improve physical strength and agility in patients with Prader-Willi syndrome. There have been some concerns regarding the effect of GH on lung function in children with this condition. Parents should discuss the possible side effects with the child's doctor.

A micropenis (very small penis) in the male infant may be corrected with [testosterone](#).

Hypogonadism may be corrected at puberty with hormone replacement.

## Prognosis:

Appropriate education will be needed for the affected person's IQ level. [Weight control](#) will allow for a much more comfortable and healthful life.



# Propionic Acidemia

## Synonyms

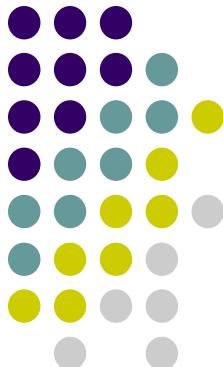
- PCC Deficiency
- Propionyl CoA Carboxylase Deficiency
- Ketotic Glycerinemia
- Hyperglycinemia with Ketoacidosis and Lactic Acidosis, Propionic Type

## Disorder Subdivisions:

- Propionic Acidemia, Type I (PCCA Deficiency)
- Propionic Acidemia, Type II (PCCB Deficiency)

## Summary:

Propionic Acidemia is a rare metabolic disorder characterized by deficiency of propionyl CoA carboxylase, an enzyme involved in the breakdown (catabolism) of the chemical "building blocks" (amino acids) of certain proteins. Symptoms most commonly become apparent during the first weeks of life and may include abnormally diminished muscle tone (hypotonia), poor feeding, vomiting, listlessness (lethargy), excessive loss of fluids from bodily tissues (dehydration), and episodes of uncontrolled electrical activity in the brain (seizures). Without appropriate treatment, coma and potentially life-threatening complications may result. In rare cases, the condition may become apparent later during infancy and may be associated with less severe symptoms and findings. Propionic Acidemia is inherited as an autosomal recessive trait.



# R.O.P. Stage 4 & 5 - Retrolental Fibroplasia

## Summary:

Retinopathy of prematurity is abnormal blood vessel development in the retina of the eye in a [premature infant](#).



## Causes:

The blood vessels of the retina begin to develop 3 months after conception and complete their development at the time of normal birth. When an infant is born very prematurely, the infant's eye development will be disrupted.

In infants who develop retinopathy of prematurity (ROP), the vessels grow abnormally from the retina into the normally clear gel that fills the back of the eye. Here, without support, the vessels are fragile and often hemorrhage into the eye.

This is followed by scar tissue development which pulls the retina loose from the inner surface of the eye and draws it toward the center of the globe, producing a retinal detachment. This can reduce vision or, if severe, result in complete [blindness](#).

Many premature infants develop transient and mild abnormal retinal blood vessel growth that converts to normal growth without treatment. Approximately 1 out of 10 infants with early changes will develop more severe retinal disease.

In the past, excess use of oxygen to treat premature babies stimulated abnormal vessel growth. Currently, oxygen can be easily and accurately monitored, and this is rare.

Today, the risk of developing ROP is proportional to the severity of prematurity. Typically all babies less than 32-34 weeks gestation are screened for the condition. However, only the smallest premature babies, no matter what their gestational age, have the highest risk.

## Symptoms:

Subtle retinal changes of ROP are visible only by [ophthalmoscopic examination](#) and cannot be seen by the parents. All premature infants are screened and followed routinely. Results of severe ROP may produce some of the following signs:

- [white pupils](#) (leukocoria)
- abnormal eye movements ([nystagmus](#))
- crossed eyes ([strabismus](#))
- severe nearsightedness ([myopia](#))

## Signs and Tests:

Retinopathy of prematurity can be diagnosed during examination by an ophthalmologist. Since there are few signs that ROP is developing, it is specially important to screen babies less than 32 weeks gestation.

Examination is painless, requiring eye drops and then examination. Follow-up examinations are conducted in approximately 2 week intervals. Special tests are usually not required.

## Treatment:

- [Cryotherapy](#) (freezing therapy).
- [Laser therapy](#) (which is now used more commonly than cryotherapy) may be used to treat areas of [retina](#) that have not had normal development of blood vessels. To be effective, this must be done before scarring and detachment occurs.
- Surgery to reattach the retina if detachment develops.
- Children with milder changes may need special low vision support as they grow.

In the early stages of ROP with proper screening, treatment is usually limited to laser therapy and close follow-up. Fortu-

## Prognosis:

The majority of infants with mild ROP can be expected to recover completely. Severe ROP may lead to marked visual abnormalities or blindness. Again, the most important factor in the outcome is early detection and treatment.

# Retinitis Pigmentosa

## Summary:

Retinitis pigmentosa is an [eye disease](#) in which there is damage to the retina. The damage gets worse (progresses) over time. People with this condition have problems with night vision and peripheral vision.

## Causes:

Retinitis pigmentosa commonly runs in families. The disorder can be caused by a number of genetic defects.

The cells controlling night vision (rods) are most likely to be affected. However, in some cases, retinal cone cells are damaged the most. The main sign of the disease is the presence of dark pigmented spots in the retina.

As the disease gets worse, peripheral vision is gradually lost. The condition may eventually lead to [blindness](#), but usually not complete blindness. Signs and symptoms often first appear in childhood, but severe visual problems do not usually develop until early adulthood.

## Symptoms:

- Vision decreased at night or in reduced light
- Loss of peripheral vision
- Loss of central vision (in advanced cases)

## Signs and Tests:

Tests determine the integrity of the retina:

- Visual acuity
- Refraction test
- Color defectiveness determination
- Pupillary reflex response
- [Slit lamp examination](#)
- Intraocular pressure determination
- Retinal examination by [ophthalmoscopy](#)
- [Ultrasound](#) of the eye
- Retinal photography
- [Fluorescein angiography](#)
- [Electroretinogram](#) (a record of the action currents of the retina produced by visual stimuli)

## Treatment:

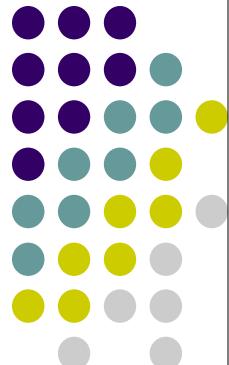
There is no effective treatment for this condition. The use of sunglasses to protect the retina from ultraviolet light may help preserve vision.

Controversial studies have suggested that treatment with [antioxidant](#) agents (such as [vitamin](#) A palmitate) may delay the disease from getting worse.

Referral to a [low vision](#) specialist is very helpful. Patients should make regular visits to an eye care specialist to screen for the development of cataracts or retinal swelling -- both of which can be treated.

## Prognosis:

The disorder will continue to progress, although slowly. Complete blindness is uncommon.



# Retinoblastoma

## Summary:

Retinoblastoma is a [malignant tumor](#) (cancer) of the retina (part of the eye) that generally affects children under the age of 6.

## Causes:

Retinoblastoma occurs when a cell of the growing retina develops a mutation in the RB gene (a tumor-suppressor gene). This mutation causes the cell to grow out of control and become cancerous.

Sometimes this mutation develops in a child whose family has never had eye cancer, but other times the mutation is present in several family members. If the mutation runs in the family, there is a 50% chance that an affected person's children will also have the mutation. They will therefore have a high risk of developing retinoblastoma themselves.

One or both eyes may be affected. A visible whiteness in the pupil may be present. [Blindness](#) can occur in the affected eye, and the eyes may appear crossed. The tumor can spread to the eye socket, and to the brain, through the [optic](#) nerve. This is a rare tumor, except in families that carry the RB gene mutation.

## Symptoms:

- A white glow in the eye that is often seen in photographs taken with a flash; instead of the typical "red eye" from the flash, the pupil may appear white or distorted.
- White spots in the pupil
- Crossed eyes
- A red, painful eye
- [Poor vision](#)
- The iris may be a different color in each eye.

## Signs and Tests:

- An examination of the eye with dilation of the pupil
- A CT or MRI study of the head to evaluate tumor and possible spread
- An [ultrasound](#) of the eye (head and eye echoencephalogram)

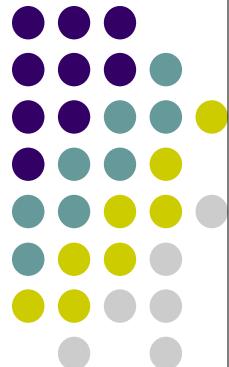
## Treatment:

Treatment options depend upon the size and location of the tumor. Small tumors may be treated by [laser surgery](#). Radiation and [chemotherapy](#) may be needed if the tumor has spread beyond the eye.

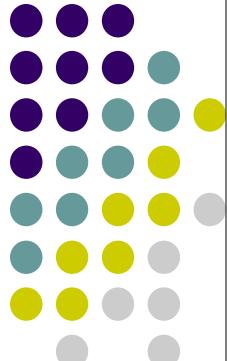
The eye may need to be removed if the tumor does not respond to other treatments. It is important to seek treatment from a physician with experience treating this rare type of tumor.

## Prognosis:

If the cancer has not spread beyond the eye, almost all patients can be cured. A cure, however, may require aggressive treatment and even removal of the eye in order to be successful. If the cancer has spread beyond the eye, the likelihood of a cure is lower and depends on how the tumor has spread.



# Rhizomelic Chondrodysplasia Punctata



## Summary:

Rhizomelic chondrodysplasia punctata is a rare, severe, inherited disease. The main features are limb shortening, bone and cartilage abnormalities visible on [x ray](#), abnormal facial appearance, severe [mental retardation](#), profound [psychomotor retardation](#), and cataracts. Skeletal abnormalities

## Diagnosis:

Although suspicion of RCDP is raised by the physical and radiographic features, the diagnosis is made by laboratory testing. People with RCDP have very specific biochemical abnormalities, i.e. abnormal levels of particular substances in bodily fluids. These abnormalities are due to the underlying defect in the peroxisome. The specific abnormalities are: 1) deficient plasmalogen synthesis with very low plasmalogen levels in red blood cells, 2) inability to process (oxidize) phytanic acid leading to elevated levels of phytanic acid in the blood, and 3) an unprocessed form of peroxisomal thiolase. Phytanic acid levels are normal at birth and increase to at least ten times normal by one year of age. Some experts recommend that confirmatory studies be performed on cells obtained by [skin biopsy](#).

## Signs and Symptoms:

(visit the link for more information, <http://www.healthline.com/galecontent/rhizomelic-chondrodysplasia-punctata>)

"Rhizomelic" refers to shortening of the bones near the center of the body (the bones of the thighs and upper arms more so than the bones of the forearms and lower legs). "Chondro" refers to cartilage and "dysplasia" to abnormal development. "Punctata" refers to specific abnormalities seen on radiological studies such as x ray. The ends of the bones near joints appear to be spotted. The spots represent dense, abnormal cartilage. The spots are also called "punctate calcifications." Other abnormalities include frozen joints (called contractures), abnormal facial features, cataracts, [hearing loss](#), severe mental retardation, and profound psychomotor retardation. People with RCDP may also have other bone abnormalities, small heads, coarse and sparse hair, and dry, red skin.

## Treatment:

The only treatments for RCDP are supportive therapies to treat symptoms. People with RCDP, especially those who are less severely affected, benefit from symptomatic support of various specialties such as [ophthalmology](#) and [physical therapy](#). Dietary restrictions or supplements have shown promise in the treatment of some peroxisomal disorders. The enormous obstacle in the severe conditions is that many of the abnormalities develop before birth and are irreversible. The multiple biochemical abnormalities of RCDP also complicate treatment efforts. Some researchers have tried to improve the function of the deficient metabolic process. This treatment, if it works, will probably benefit mildly affected patients more than the typically severely affected person with RCDP.

## Prognosis:

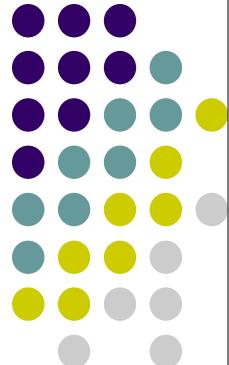
The prognosis for the typical individual with RCDP, who is severely affected, is death in infancy. Most affected infants die in the first two years of life. However, exceptions have reported in the medical literature. Individuals who lived past the age of 10 years have been reported. For atypical, mildly affected patients, prognosis is variable.

Scientists' understanding of peroxisomal disorders, and of the peroxisome itself, increased enormously in the last five years. Developing effective treatments of RCDP is a great challenge. But having a better understanding of the underlying cause is the first step. This has also increased awareness of RCDP, probably leading to more accurate diagnoses and higher clinical suspicion. A correct diagnosis is critical in providing accurate recurrence, prognosis, and prenatal diagnosis information.

<http://www.healthline.com/galecontent/rhizomelic-chondrodysplasia-punctata/2>

# Ring Chromosome 13

**Summary:** A syndrome in which parts of both ends of chromosome 13 have been lost (deletion) and the two broken ends reunited to form a ring-shaped figure. Phenotypic expression varies according to breakpoint locations and lengths of deleted segments. Some patients exhibit only minor dysmorphic features but most are severely affected by a wide range of abnormalities. The clinical picture in many cases is similar to that seen in terminal deletions of the long arm of chromosome 13 and includes retinoblastoma, mental and growth retardation, brain malformations, heart defects, distal limb deformities, and digestive, urogenital, and other abnormalities, and some cases of ring chromosome 13 share many common characteristics with the Garcia-Lurie syndrome, including aprosencephaly, atelencephaly, microcephaly, craniofacial dysproportion, urogenital anomalies, adrenal hypoplasia, digital abnormalities, and severe retardation.



**Head and neck:** Anencephaly, microcephaly, aprosencephaly, atelencephaly, turricephaly, micrognathia, sloping forehead, and mandibular cleft.

**Ears:** Low-set malformed ears,

**Eyes:** Retinoblastoma, microphthalmos, hypertelorism, coloboma, cyclopia, aniridia, and downslanting palpebral fissures.

**Nose:** Flat bridge.

**Mouth and oral structures:** Cleft lip and palate and highly arched palate.

**Thorax:** Agenesis of sternum.

**Hand and foot:** Absent or hypoplastic thumbs and big toes, fused toes, pes calcaneovalgus, fusion of metacarpal bones, brachydactyly, syndactyly, polydactyly, oligodactyly, and clubfoot. Dermatoglyphic finding consist of simian creases.

**Spine:** Vertebral malformations.

**Skin:** Pigmentation disorders.

**Skin appendages:** Alopecia areata.

**Nervous system:** Hypoplasia or aplasia of corpus callosum and forebrain, malformed cerebral ventricles, hypoplasia of temporal and frontal lobes, hydrocephaly, aplasia of olfactory tracts, hypoplasia of optic nerve, encephalocele, and cerebral calcifying angiopathy.

**Cardiovascular system:** Atrial septal defect, ventricular septal defect, tetralogy of Fallot, patent ductus arteriosus, coarctation of aorta, situs inversus, and common aortopulmonary trunk.

**Gastrointestinal system:** Duplication of esophagus, duodenal atresia, cecum mobile, anal stenosis, Hirschsprung disease (megacolon and neural plexuses), intestinal malrotation, imperforate anus, and aplasia of small intestine.

**Urogenital system:** Hypoplastic kidney, dilated collecting system, hydronephrosis, ambiguous genitalia, hypospadias, small penis, absent uterus, bifid scrotum, cryptorchidism, dysplasia of labia majora and clitoris, and penoscrotal transposition.

**Endocrine system:** Adrenal hypoplasia.

**Growth and development:** Growth, motor, speech, and mental retardation and delayed puberty.

# Schizencephaly

## Summary:

Schizencephaly, or "split brain," is a neurological disease caused by abnormal development of the brain, leading to the characteristic appearance of abnormal clefts in either one or both cerebral hemispheres. The exact etiology is unknown, although it is classified as a type of neuronal migration disorder and thought to be due to a defect in development that occurs during the period of one to seven months of fetal gestation.

## Diagnosis:

Diagnosis is made by imaging of the brain. A computed [tomography](#) scan (**CT**) or **MRI** demonstrates the abnormal clefts, which may be bilateral or unilateral, open or closed lip. The clefts may appear symmetric or asymmetric. MRI may show evidence of polymicrogyria lining the clefts. There is no genetic testing available at this time for schizencephaly.

## Causes:

The cause of schizencephaly is unknown, although environmental and genetic factors have been proposed. Various theories exist as to the timing and nature of the defect in development. Early injury to the brain during the second trimester of pregnancy has been proposed to cause the characteristic clefts. These insults may be due to infection, poor blood flow causing [stroke](#), or genetic abnormalities. The earlier onset of injury leading to absence of scar tissue around the defect presumably differentiates schizencephaly from porencephaly. A mutation in the EMX2 gene has been associated with schizencephaly in some familial cases, providing evidence for genetic causes. EMX2 is a transcription factor on human chromosome 10 that is important in early brain formation in mice and flies. The clefts in schizencephaly are often lined by normal brain tissue, but may often be surrounded by abnormal brain tissue that has an unusually high density of folding (polymicrogyria). Schizencephaly may also be associated with abnormal nerve clusters called heterotopias in different parts of the brain. Polymicrogyria and heterotopias are thought to be due to defective neuronal migration, and their association with schizencephaly suggests a common underlying mechanism.

## Symptoms:

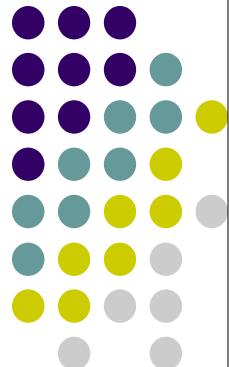
Symptoms can vary widely depending on the extent and the size of the cleft. Patients may show [developmental delay](#) that can range from mild to severe. Bilateral and open-lip clefts are associated with more severe delay. Affected individuals may have small heads ([microcephaly](#)) or increased pressure due to fluid accumulation inside the brain, known as [hydrocephalus](#). [Paralysis](#) of the limbs may be present. The paralysis may be on one or both sides of the body depending on the location of the clefts. Abnormal muscle tone, including decreased tone ([hypotonia](#)) and increased tone ([spasticity](#)), can be seen. Some patients may have only seizures. Seizures usually present before three years of age, but patients may present with seizures in later life as their only symptom and then be diagnosed with schizencephaly by brain imaging.

## Treatment:

There is no cure for schizencephaly at this time. The treatment of schizencephaly is directed towards the symptoms caused by the abnormally formed brain. Seizures may require [anticonvulsant drug](#) therapy. Seizures that cannot be controlled with medications may be treated by [surgical removal](#) of the abnormal tissue surrounding the cleft. With complications of hydrocephalus, a [surgical shunt procedure](#) may be necessary to relieve fluid accumulation and pressure.

## Prognosis:

The prognosis for individuals with schizencephaly depends on the amount of neurologic deficiency associated with the malformation. Some patients with unilateral clefts may only have seizures and no other cognitive or motor abnormalities. Seizures may respond to medications or require surgery if unmanageable. Patients with severe [mental retardation](#) and paralysis will often require lifelong dependent care and may have a shortened lifespan as a result of infections such as pneumonias. Bilateral clefts are associated with earlier onset of seizures and seizures that are more difficult to treat.



# Seckel Syndrome

## Summary:

Seckel syndrome is an extremely rare inherited disorder characterized by low birth weight, dwarfism, a very small head, mental retardation, and unusual characteristic facial features, including a "beak-like" protrusion of the nose, large eyes, a narrow face, low ears, and an unusually small jaw. Common signs also include abnormalities of bones in the arms and legs.

## Diagnosis:

Several forms of primordial dwarfism exhibit characteristics similar to those of Seckel syndrome, and it can be challenging for physicians to differentiate true Seckel syndrome from other similar dwarfisms. Physicians do have a set of primary diagnostic criteria to follow—the criteria were first defined by Dr. Seckel in 1960 and later revised (1982) to prevent over-diagnosis of cases.

Most of the primary diagnostic features of Seckel syndrome, which include severe intrauterine growth restriction, a small head, characteristic "bird-like" facies, and mental retardation, are well suited for prenatal sonographic diagnosis. The use of ultrasound examinations to evaluate fetal growth and the careful evaluation of the fetal face and cranial anatomy have proven effective at detecting Seckel syndrome.

## Signs and Symptoms:

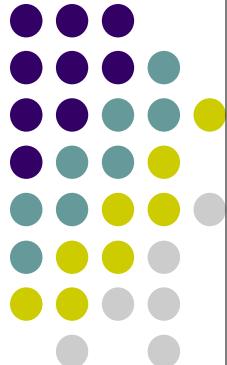
Prenatal signs of Seckel syndrome include cranial abnormalities and growth delays (intrauterine growth retardation) resulting in low birth weight. Postnatal growth delays result in dwarfism. Other physical features associated with the disorder include a very small head (often more severely affected than even the height), abnormalities of bones in the arms and legs, malformation of the hips, a permanently bent fifth finger, failure of the testes to descend into the scrotum (for males) and unusual characteristic facial features, including a "beak-like" protrusion of the nose, large eyes, a narrow face, low ears, and an unusually small jaw. Children with the disorder not only have a small head but also a smaller brain, which leads to developmental delay and mental retardation. Seizures have also been reported.

## Treatment:

There is no cure for Seckel syndrome. Certain medications may be prescribed to address other symptoms associated with the disorder.

## Prognosis:

Children affected with Seckel syndrome can live for an extended period of time, although they are often faced with profound mental and physical deficits.



# Seizures with Congenital Brain Malformation

## Causes:

Congenital brain defects may have genetic, infectious, toxic, or traumatic causes. In most cases, no certain cause can be identified.

Some brain defects are caused by trisomy, the inclusion of a third copy of a chromosome normally occurring in pairs. Most trisomies occur because of improper division of the chromosomes during formation of eggs or sperm. Trisomy of chromosome 9 can cause some cases of Dandy-Walker and Chiari II malformation. Some cases of holoprosencephaly are caused by trisomy of chromosome 13, while others are due to abnormalities in chromosomes 7 or 18. Individual gene defects, either inherited or spontaneous, are responsible for other cases of congenital brain malformations.

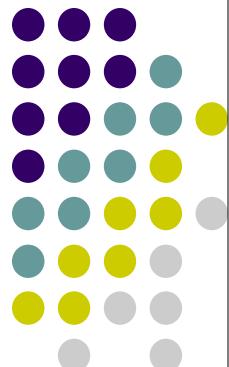
Other causes of congenital brain defects include:

- intrauterine infections, including cytomegalovirus, rubella, herpes simplex, and varicella zoster
- maternal diabetes mellitus
- maternal phenylketonuria
- fetal trauma

## Symptoms:

Besides the features listed above, symptoms of congenital brain defects may include:

- Chiari II malformation: impaired swallowing and gag reflex, loss of the breathing reflex, facial paralysis, uncontrolled eye movements (nystagmus), impaired balance and gait.
- Dandy-Walker malformation: symptoms of hydrocephalus, lack of muscle tone or "floppiness," seizures, spasticity, deafness, irritability, visual impairment, deterioration of consciousness, paralysis.
- Lissencephaly: lack of muscle tone, seizures, developmental delay, spasticity, cerebral palsy.
- Hydranencephaly: irritability, spasticity, seizures, temperature oscillations.
- Megalencephaly due to neurological or metabolic disease: mental retardation, seizures.



# Septo-Optic Dysplasia

## Summary:

Septo-optic dysplasia (SOD) is a rare congenital disorder that includes underdevelopment of the nerves at the back of the eye(s), absence of a part of the brain called the septum pellucidum and/or corpus callosum, and dysfunction of the pituitary gland that produces hormones in the body.

## Diagnosis:

SOD is often suspected when a child with visual impairment also has growth delay. When a diagnosis of SOD is suspected, a person is referred to several specialists who each perform tests to verify the diagnosis. An [ophthalmologist](#) can perform vision testing and examinations of the structure of the eye for features of SOD. In individuals with SOD, the optic nerves appear small and gray or pale in color and can be surrounded by a double pigmented ring or margin. In addition, stimulation testing of the optic nerves can be performed. A [neurologist](#) (brain specialist) can perform imaging studies of the brain, such as [magnetic resonance imaging](#) (MRI) or computerized [tomography](#) (CT) scan of the brain, focusing on the visual pathways, the septum pellucidum, hypothalamus-pituitary region, and other midline structures. An endocrinologist can perform blood tests to determine if there are problems with various hormones in the body.

There has been a report of prenatal diagnosis of SOD by an [ultrasound](#) that revealed absence of the septum pellucidum. Subsequent [blood and urine](#) tests on the mother revealed low levels of the hormone estriol, indicating a problem with the fetal pituitary gland. The diagnosis was confirmed after birth.

## Signs and Symptoms:

(for more information, visit: <http://www.healthline.com/galecontent/septo-optic-dysplasia/2>)

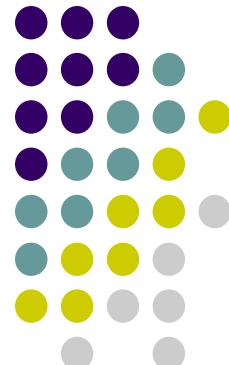
A variety of changes in the structure and function of the eye(s) can occur as part of SOD. Most commonly, individuals have optic nerve hypoplasia, meaning that the nerves from the back of the eye to the brain are underdeveloped. The nerves may be small, and there are usually far fewer nerves connecting the eye to the brain than usual. The optic disk (the front surface of the optic nerve) may also be smaller than usual. Infants with SOD may have rapid, involuntary eye movements called [nystagmus](#). Other changes in the structure of the eye may occur, such as [strabismus](#) (the eyes can not focus on the same object at the same time), [coloboma](#) (notch-like area of absent tissue), and microphthalmia (small openings of the eyes). The optic features of SOD may affect one or both eyes, so that an individual with the condition may have good vision in one eye, or may have decreased or no vision in both eyes.

## Treatment:

SOD is treated symptomatically. Vision may be improved with corrective lenses, surgery or other treatment. Seizures may be controlled with medication. Hormone deficiencies are managed with [hormone replacement therapy](#), such as growth hormones or thyroid supplements. Hormone problems may arise at different ages, so even if not present initially, a person with SOD should be followed by an endocrinologist over time. Children with SOD should receive early assessments of learning and development so that any supportive therapies, such as physical, speech, or educational therapy, can be initiated. Children with SOD may benefit from an individualized educational plan (IEP) in school, which is a plan created by a child's teachers, therapists, and other individuals who have performed developmental testing and designed techniques best suited to the child's needs. Families may consider placing a child with SOD in a school for visually impaired children. The child's pediatrician can monitor a child for any special needs and refer additional specialists as needed. Individuals and families with SOD may benefit from talking with a genetic counselor about possible patterns of inheritance and recurrence risks for SOD in the family. Families should also be introduced to the appropriate local and national support organizations, such as the American Foundation for the Blind, for further help and assistance.

## Prognosis:

Prognosis is variable, depending on the number and severity of features present. Most individuals with SOD have significant visual impairment, and many are legally blind. Patients with severe visual impairment may have difficulty obtaining a driver's license or gainful employment. Lifespan is most often normal, however, [cortisol](#) deficiency can lead to life-threatening episodes brought about by infection or [stress](#).

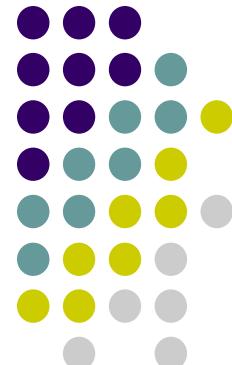


# Severe Attachment Disorder (ASD)

## Summary:

Reactive attachment disorder is a disturbance of social interaction caused by neglect of a child's basic physical and emotional needs, particularly during infancy.

Babies placed in orphanages at birth and raised by multiple caretakers without primary parent-figures can also develop this disorder, even if physical care was adequate.



## Causes, Incidence, and Risk Factors:

Reactive attachment disorder is caused by neglect of an infant's needs for physical safety, food, touching, and emotional bonds with a primary and/or secondary caretaker.

The risk of neglect to the infant or child is increased with parental isolation, lack of parenting skills, teen parents, or a caregiver who is mentally retarded. A frequent change in caregivers (for example, orphanages or foster care) is another cause of reactive attachment disorder.

Children adopted from foreign orphanages are commonly affected, particularly if they were removed from their birth parents during the first weeks of life.

## Symptoms:

Child:

- Resists social interaction
- Seeks isolation
- Difficult to comfort
- Avoids physical contact
- Avoids caregiver
- Indiscriminate sociability with strangers
- 

Caregiver:

- Disregard for child's basic emotional needs for comfort, stimulation, and affection
- Disregard for child's basic physical needs like food, toileting, and play

## Signs and Tests:

A complete history and physical examination, and psychiatric evaluation can help diagnose this disorder.

## Treatment:

Treatment is twofold. The first priority is to make sure the child is currently in a safe environment where emotional and physical needs are met. Once that has been established, the next step is to alter the relationship between the caregiver and the child, if the caregiver has caused the problem. Parenting skills classes can help with this. These skills give the caregiver an ability to meet the child's needs and help them bond with their child. The caregiver should also undergo counseling to work on any current problems, such as drug abuse or family violence. Social Services should follow the family to make sure the child remains in a safe, stable environment. Parents who adopt babies or young children from foreign orphanages should be aware that this condition may occur and be sensitive to the needs of the child for consistency, physical affection, and love. These children may be frightened of people and find physical affection overwhelming at first, and parents should try not to see this as rejection. It is a normal response in someone who has been maltreated to avoid contact. Hugs should be offered frequently, but not forced. A comprehensive mental health evaluation should be completed. This evaluation will be helpful in developing a treatment plan.

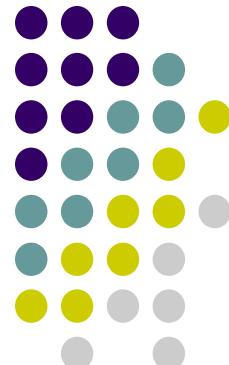
## Prognosis:

With appropriate intervention, the outcome can be improved. <http://www.nlm.nih.gov/medlineplus/ency/article/001547.htm>

# Severe Sensorineural Hearing Loss

## Summary:

Sensorineural [hearing loss](#) (also called nerve deafness or sensorineural deafness) is loss of hearing resulting from problems in the inner ear, in the nerve from the inner ear to the brain, or in the brain.



## Diagnosis of Sensorineural Hearing Loss:

The doctor will conduct a thorough ear examination, note the patient's medical history and ask about hearing problems affecting other members of the family.

Depending on the patient's condition and age, hearing tests, a head CT (computed tomography) scan or head MRI (magnetic resonance imaging), and an EEG (a test that records the minute electrical impulses produced by the activity of the brain) for hearing may be performed.

## Causes and Risk Factors of Sensorineural Hearing Loss:

Although sensorineural [hearing loss](#) is considered an idiopathic (no known cause) condition, researchers believe that other factors besides age (as in presbycusis), hereditary (as in hearing loss at birth and later in life) and environmental and physical factors (as in trauma-induced problems, tumors, noise damage and drug-induced hearing loss) may play a role in hearing loss. These factors include:

- Viral infections such as [influenza](#), rubeola, rubella, mumps, [herpes simplex](#) and CMV.
- Vascular diseases such as [leukemia](#) and sickle cell [anemia](#)
- Autoimmune diseases such as [lupus](#) and temporal arteritis

## Symptoms of Sensorineural Hearing Loss

- In babies with congenital deafness, failure to respond to sounds
- In babies with congenital deafness, no baby babbling or other baby noises
- Sounds heard are quieter, distorted and less clear
- High tones are less audible
- The sounds "s", "f", and "z" are not heard
- Speech may be difficult to understand if there is background noise
- [Tinnitus](#)
- [Vertigo](#) (dizziness and loss of balance)

## Treatment and Prognosis:

The treatment for sensorineural [hearing loss](#) is often the use of hearing aids or [cochlear implants](#).

A **hearing aid** is a small electronic device that fits into the ear. A hearing aid consists of a tiny microphone to pick up the sounds, an amplifier that increases the volume and a tiny speaker that transmits sounds to the ear.

A **cochlear implant** is an electronic device implanted behind the ear. Unlike a hearing aid that amplifies sounds, cochlear implants directly stimulate the auditory nerve fibers in the cochlea. The implant consists of internal and external components.

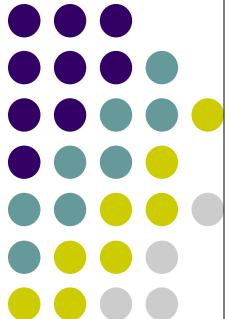
The internal component is a receiver/stimulator that is positioned under the skin in a bed created in the bone behind the ear. An electrode array, consisting of 22 tiny bands arranged within a biocompatible tubing is surgically inserted approximately one inch into the cochlea.

The external components include a light-weight speech processor and a head-set composed of a directional microphone worn behind the ear and a transmitter that is held in place over the implanted receiver by small magnets.

# Shaken Baby Syndrome

## Summary:

This is a severe form of [head injury](#) caused by violently shaking an infant or child, usually when the infant is crying inconsolably and the frustrated caregiver loses control. The violent shaking may result in severe injuries to the infant, permanent brain damage, or death. Shaken baby injuries usually occur in children younger than 2 years old but may be seen in children up to the age of 5.



## Causes:

In most cases, an angry parent or caregiver shakes the baby to punish or quiet the child. Many times the caregiver did not intend to harm the baby. Nevertheless, it is a form of [child abuse](#).

Shaken baby syndrome does not result from gentle bouncing, playful swinging or tossing the child in the air, or jogging with the child. It also is very unlikely to occur from accidents like falling off chairs or down stairs, or accidentally being dropped from a caregiver's arms. Short falls may cause other types of head injuries, although these are often minor.

## Symptoms:

The symptoms can vary from mild to severe. They may include:

- Extreme irritability or other changes in behavior
- Lethargy, sleepiness, not smiling
- Poor feeding, lack of appetite
- Decreased alertness
- [Loss of consciousness](#)
- Pale or bluish skin
- [Vomiting](#)
- Convulsions (seizures)
- Not breathing

There are usually no outward physical signs of trauma, such as bruising, bleeding, or swelling. An [ophthalmologist](#) examining the infant's eyes may detect retinal hemorrhage (bleeding behind the eye) or [retinal detachment](#).

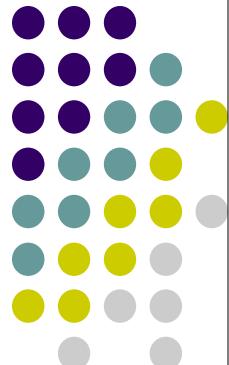
In some cases, the condition can be difficult to diagnose and may not be identified during an office visit.

# Smith–Magenis Syndrome

## Summary:

Smith-Magenis syndrome (SMS) is a relatively rare [genetic disorder](#) characterized by a specific pattern of physical, behavioral, and developmental features. First described in 1982 by Ann C.M.

Smith (a [genetics](#) counselor) and Ellen Magenis (a physician and [chromosome](#) expert), the syndrome results from a deletion on chromosome 17, specifically referred to as deletion 17p11.2.



## Diagnosis:

Although SMS is generally believed to be underdiagnosed, with increased professional awareness and improved methods of testing, the number of individuals identified increases annually. In diagnosing the disorder, the characteristic behavioral features of SMS are usually recognized before the

## Symptoms:

Although there are many features associated with SMS, not every individual exhibits all of these features. The following is a common list of traits that have been reported:

- Distinct facial features: brachycephaly, flat mid-face area, prominent forehead, eyelid folds, broad nasal bridge, protruding jaw, and low-set ears
- brachydactyly (short fingers and toes)
- [short stature](#)
- [hoarse](#), deep voice
- speech delay
- learning disabilities
- chronic ear infections
- mental retardation (typically in the 50-60 range for IQ)
- [poor muscle tone](#) and/or feeding problems in infancy
- eye disorders
- sleep disturbances
- insensitivity to [pain](#)
- behavioral problems: [hyperactivity](#), head banging, hand/nail biting, skin picking, pulling off fingernails and toenails, explosive outbursts, tantrums, destructive and aggressive behavior, excitability, arm hugging/squeezing when excited
- engaging and endearing personality

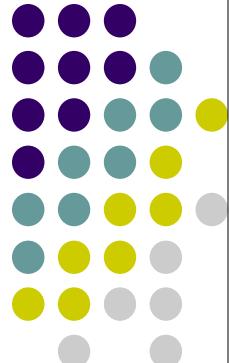
## Prognosis:

Although there is no medical prevention or cure for SMS, early diagnosis gives parents time to learn about and prepare for the challenges of the disease. Although there is insufficient data regarding the average life expectancy of those diagnosed with SMS, some individuals have lived well into their 70s.

# Spina Bifida

## Summary:

Spina bifida belongs to a group of disorders known as neural tube defects (NTDs). These all involve problems in the development and closure of the neural tube, a structure in the human fetus that begins forming very early in a pregnancy. The neural tube eventually becomes the spinal column. When the neural tube does not close properly, it can lead to spina bifida, a disruption in the spinal column. Spina bifida occurs to varying degrees of severity, and in various forms.



## Diagnosis:

A early time to find spina bifida is during a detailed prenatal ultrasound scan, especially between 16 and 20 weeks gestation (from the last menstrual period). Ultrasounds cannot identify every structural problem in a developing baby, so some cases of spina bifida (especially mild forms) may be missed. However, it is a risk-free method to use that gives immediate results.

## Causes:

 (visit the link at the bottom of the page for more information)

Spina bifida occurs because the neural tube, around the area of the spine, fails to close during fetal development. A multifactorial cause for this has been assumed, because multiple factors seem to be involved. It may best be described as an interaction between multiple genes and the environment. Many aspects of this interaction are still not well understood. As well, an exact neurological cause for spina bifida has not been identified.

## Treatment:

 (visit the link at the bottom of the page for more information)

There is no known cure for spina bifida. Treatment primarily focuses on dealing with symptoms as they arise, since they vary so greatly from person to person.

Surgery to correct the spinal problem in spina bifida cystica is often done. This involves carefully tucking the spinal contents back into the spinal column, and closing the covering back up. This often happens shortly following birth to reduce the risk of developing an infection, and requires some time to heal afterward. Surgery has not been known to allow someone to regain functions they would not have had otherwise like movement, bowel, or bladder control.

## Prognosis:

 (visit the link at the bottom of the page for more information)

Prognosis in spina bifida is extremely varied and unpredictable. Years ago with far less intervention and fewer treatments available, someone with severe spina bifida had a high chance to die from complications. Mortality may still be high in complex cases even today. Conversely, those with a mild form of spina bifida may never even know they have it unless they have an internal imaging scan for an unrelated reason. As such, they may never have complications related to spina bifida and would have an average life span.

Today, there are far more options for helping those with spina bifida. Information can be learned during a pregnancy, allowing parents to make decisions and potentially prepare before birth. These treatments and therapies help maintain a better quality of life for those with spina bifida, and continue to offer hope.

# Spinal Cord Injury

## Summary:

[Spinal cord injury](#) (SCI) is damage to the spinal cord that results in a loss of function such as mobility or feeling. The spinal cord does not have to be severed in order for a loss of function to occur. In most SCI cases, the spinal cord is intact, but the damage to it results in loss of function.

## Diagnosis:

The possibility of SCI is usually suspected in anyone with significant trauma to the head and/or neck. Physicians accordingly assume that such patients have a spine [fracture](#) until proven otherwise.

Diagnosis is established with the help of x-rays of the spine that allow doctors to determine the extent of the damage. The following imaging tests are also used: [CT scan \(computed tomography\)](#), [MRI \(magnetic resonance imaging\)](#), and [myelogram](#) (x ray after injection of dye into the spinal canal).

## Causes and Symptoms:

According to the National Spinal Cord Injury Association (NSCIA), spinal cord injuries are caused in the United States by motor vehicle accidents (44%), acts of violence (24%), falls (22%), **sports** (8%), and other causes (2%) such as abscesses, tumors, [polio](#), [spina bifida](#) and Friedrich's [Ataxia](#), a rare inherited disorder. For infants, motor vehicle crash is the leading cause of SCI. Falls rank highest for ages two to nine years and sports for the 10 to 14 age group. The most common injury level for the five to 13 age group is the high cervical spine (C1-C4).

SCI symptoms usually appear immediately after the injury. However, symptoms can develop slowly, if an infection or [tumor](#) is gradually increasing pressure on the spinal cord. General symptoms are as follows:

- weakness, poor coordination or paralysis, particularly below the level of the injury
- **numbness**, tingling, or loss of sensation
- loss of bowel or bladder control
- [pain](#)

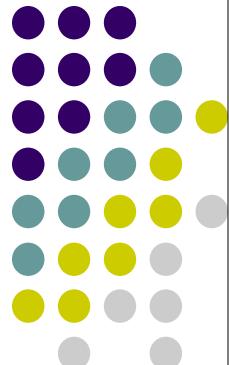
## Treatment:

A person suspected of having a spinal cord injury should not be moved and treatment of SCI begins with **immobilization**, commonly achieved by enclosing the cervical spine in a rigid collar and use of rigid backboards. Paramedics and other rescue workers receive extensive training in immobilizing the spine. Immobilization prevents further injuries to the cord at the scene of the injury and has helped reduce worsening of any neurological SCI injury. At the time of injury, treatment is focused on stabilizing the spine and relieving [cord compression](#). Prompt steroid drug injections (within eight hours of the injury) are also used to minimize cell damage and improve the chance of recovery.

Surgery cannot reverse damage to the spinal cord but is often needed to stabilize the spine to prevent future pain or [deformity](#). It may involve fusing together vertebrae or inserting metal pins; or removing bone chips, bullets, or other **foreign objects**; or draining fluid to relieve pressure. Long-term treatment of spinal cord injuries usually involves [drug therapy](#), the use of neural prostheses, and [rehabilitation](#). Complementary treatment includes **nutrition** management, psychological counseling, and careful monitoring by physicians.

## Prognosis:

The prognosis of SCI depends on the location and extent of injury. Once the initial injury heals, functional improvements may continue for at least six months. Any disability that remains after that point is likely to be permanent. Injuries of the neck above C4 with significant involvement of the diaphragm have worse outcomes. Although SCI often results in permanent disability, rehabilitation can maximize the level of function and help patients adapt and lead independent, productive lives.



# Spinal Muscular Atrophy

## Summary:

Spinal muscular atrophy is a group of inherited diseases that cause progressive muscle degeneration and weakness, eventually leading to death.

## Symptoms:

In an infant:

- Floppy infant
- Very weak infant
- Little spontaneous movement
- Lack of head control
- Feeding difficulty
- Breathing difficulty
- Progressive weakness (older infant to toddler)

In a child:

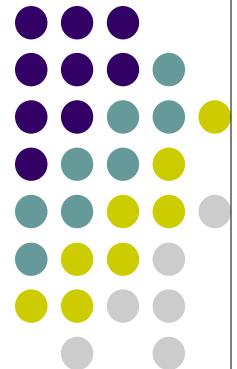
- Nasal speech
- Worsening posture
- Frequent, increasingly severe respiratory infections

## Signs and Tests

- A family history of neuromuscular disease
- Absent deep tendon reflexes
- Flaccid muscles
- Muscle fasciculation
- Fasciculation of tongue muscle
- Elevated CPK levels

Tests:

- Muscle biopsy
- Electromyography
- MRI of the spine
- DNA testing to confirm diagnosis



## Causes:

Spinal muscular atrophy (SMA) is the second leading cause of neuromuscular disease. It is inherited as an autosomal recessive trait (a person must get the defective gene from both parents to be affected) and has an incidence of approximately 4 per 100,000 people.

In its most severe form (SMA type I, also called Werdnig-Hoffman disease), infants are born floppy with weak, thin muscles and feeding and breathing problems. Their lifespan seldom exceeds 2 to 3 years. Infants with SMA type II have less severe symptoms during early infancy, but they become progressively weaker with time. Survival time with type II is longer, but the disease kills most of those affected while they are still children.

SMA type III is the least severe form of the disease, and symptoms may not appear until the second year of life. Often, weakness is first noted in the shoulder muscles and proximal leg muscles. Weakness is progressive and will eventually become profound, but children with type III disease may survive into early adulthood.

Rarely, SMA may begin in adulthood. This is usually a milder form of the disease. This form may be inherited in an autosomal dominant (only one copy of the gene is needed for the disease to occur) or autosomal recessive manner.

Family history of spinal muscular atrophy is a risk factor for all types of the disorder.

## Treatment:

There is no treatment for the progressive weakness caused by the disease. Supportive care is important. Attention must be paid to the respiratory system, because affected people have difficulty clearing secretions. Respiratory complications are common.

Physiotherapy is important to prevent contractures and scoliosis. Bracing may be necessary.

## Prognosis:

The most severe form of spinal muscular atrophy is fatal early on. The less severe form is compatible with a longer life-span. However, progressive weakness and debility are present in all forms.

# Stickler Syndrome

## General Discussion:

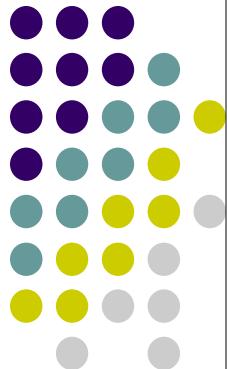
Stickler syndrome refers to a group of disorders of the connective tissue that involves several of the body's organ systems such as the eye, skeleton, inner ear, and/or the head and face. Connective tissue is made up of a protein known as collagen that develops into the several varieties found in the body. It is the tissue that physically supports many organs in the body and may act like a glue or an elastic band that allows muscles to stretch and contract. Stickler syndrome often affects the connective tissue of the eye, especially in the interior of the eyeball (vitreous humor), and the ends of the bones that make up the joints of the body (epiphysis).

Most authorities agree that there are four types of Stickler syndrome, of which three are reasonably well differentiated and a fourth remains not well understood.

Stickler syndrome Type I; (STL1): This form is responsible for about 75% of reported cases and presents with a full array of symptoms (eye, ear, jaw and cleft, joints).

Stickler syndrome Type II; (STL2): Patients with this form also present with a full array of symptoms.

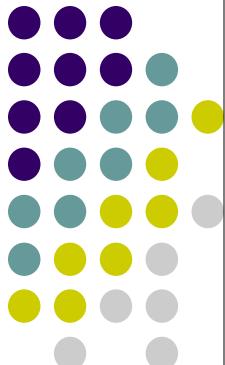
Stickler syndrome Type III; (STL3): Patients with this form present with a "Sickler-like" syndrome that affects the joints and hearing without involving the eyes. This form is also known as Oto-spondylo-megaepiphyseal dysplasia (OSMED).



# Syringohydromyelia

## Summary:

**Syringohydromyelia:** Longitudinal cavities in the spinal cord, most often in the cervical region, which may extend for multiple spinal levels. The cavities are lined by dense, gliogenous tissue and may be associated with SPINAL CORD NEOPLASMS; spinal cord traumatic injuries; and vascular malformations. Syringomyelia is marked clinically by pain and PARESTHESIA, muscular atrophy of the hands, and analgesia with thermal anesthesia of the hands and arms, but with the tactile sense preserved (sensory dissociation). Lower extremity spasticity and incontinence may also develop. (From Adams et al., Principles of Neurology, 6th ed, p1269)



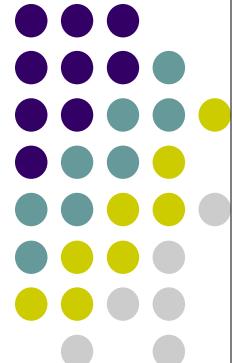
# Tar Syndrome

## Summary:

Thrombocytopenia-absent radius (TAR) syndrome is a rare condition that is apparent at birth. Affected infants are born with incomplete or missing forearms. Typically, the bone on the thumb side of the forearm (radius) is absent, but other bones may be missing or abnormally formed. TAR syndrome also causes life-threatening bleeding episodes due to low levels of platelets in the blood (thrombocytopenia). It is inherited in an autosomal recessive manner.

## Diagnosis:

Diagnosis of TAR syndrome is made with the use of x rays of the bones, and by testing for low platelet levels in the blood at birth. TAR syndrome can be diagnosed during pregnancy. By using ultrasound (sound waves) at around 16-20 weeks of pregnancy, the shortening of the arms can be seen. A second test is then done called cordocentesis. In this procedure, using ultrasound guidance, a thin needle is introduced through the mother's abdomen into the amniotic sac. A blood sample is taken directly from the umbilical cord. With this blood sample, a count of the platelets can be done. If the platelet count is low, along with the short arms (absent radii), the diagnosis of TAR syndrome is made.



## Signs and Symptoms:

Aside from the limb deficiencies and the thrombocytopenia, the heart can also be affected. Around one-third of these infants are born with heart defects. These are usually found at birth. The heart problems include holes in the atrial chamber of the heart (atrial septal defect) and tetralogy of Fallot. The name tetralogy of Fallot means there are four different defects of the heart. Because of the high risk for excessive bleeding to occur, these infants are not good candidates for heart surgery. Some of them have died from heart failure.

## Prognosis:

About 40% of these individuals die in infancy, usually due to severe bleeding episodes. Cow's milk allergy or intolerance is a common problem. Stomach infections seem particularly threatening to these infants, and can also trigger the bleeding episodes. The thrombocytopenia is treated with platelet transfusions, which may or may not control the bleeding, and death may occur.

The thrombocytopenia seen in TAR syndrome does improve with age. If these individuals survive the first two years of life, they appear to have a normal life span. However, the easy bruising continues throughout life. Many females with TAR syndrome also have abnormal menstrual periods, possibly related to the thrombocytopenia.

Surgery is sometimes done in an attempt to straighten and improve the use of their hands. They may wear corrective braces for the forearms. Many of these individuals develop arthritis, especially of the wrists and knees as they get older. This may further limit the use of their hands and legs. However, most individuals with TAR syndrome learn to adapt well to their disability, and lead productive lives.

# Tay–Sachs Disease

## Summary:

Tay-Sachs disease is a familial disorder (it affects more than 1 member of a family) that results in early death. It is found predominantly in Ashkenazi Jewish families.

## Causes, Risk Factors, Incidence:

Tay-Sachs disease is caused by a deficiency of hexosaminidase, an enzyme that is important in the metabolism of gangliosides (a type of chemical substance found in nerve tissue).

These gangliosides, particularly ganglioside GM2, then accumulate in the brain, causing neurological deterioration. Tay-Sachs disease is inherited as a recessive gene, and 1 in 25 members of the Ashkenazi Jewish population carries the gene.

Tay-Sachs has been classified into infantile, juvenile, and adult forms, depending on the type of symptoms and when they first appear. The majority of people with Tay-Sachs have the infantile form.

Symptoms generally begin to appear when the child is 3 - 6 months old. The disease tends to progress rapidly, and the child usually dies by the age of 4 or 5 years.

## Symptoms:

- Loss of motor skills
- Increased startle reaction
- Decreased eye contact, [blindness](#)
- Deafness
- [Dementia](#)
- Listlessness
- Irritability
- Seizures
- [Paralysis](#) or loss of muscle function
- Decreased muscle tone (loss of muscle strength)
- Delayed mental and social skills
- Slow growth

## Signs and Tests:

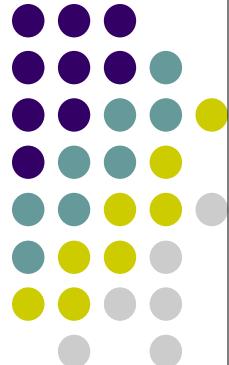
- Family history
- [Physical examination](#)
- Enzyme [analysis of blood](#) or body tissue for hexosaminidase levels
- [Eye examination](#) (reveals a cherry-red [spot](#) in the [macula](#))

## Treatment:

There is no treatment for Tay-Sachs disease itself, only ways to make the patient more comfortable.

## Prognosis:

Children affected with this disease have progressive symptoms and usually die by 4 - 5 years of age.



# Tetrasomy 12p

## (Pallister-Killian Syndrome)

### Summary:

Pallister-Killian syndrome (PKS) is a rare **chromosome** abnormality in which a person has four copies of the short arm of chromosome 12 instead of the normal two copies. Affected individuals have unusual facial features, mental retardation, seizures, patchy color differences in the skin, and various other physical abnormalities. Many fetuses with Pallister-Killian syndrome die during pregnancy or soon after birth.

### Diagnosis:

Pallister-Killian syndrome may be suspected from a person's physical features, but a diagnosis requires that a person has the characteristic chromosome abnormality, **tetrasomy 12p**. PKS is different from many types of chromosomal syndromes in that the causative chromosome abnormality is not found from chromosome studies on the blood. Chromosome testing on skin cells will show the characteristic chromosome abnormality in at least some of the cells. It is believed that the characteristic chromosome abnormality, the isochromosome 12p, does not show up in the blood cells because the abnormal isochromosome is lost in the rapid cell division that creates these blood cells. Diagnosis of Pallister-Killian syndrome has traditionally required a skin biopsy, but recent reports indicate that the diagnosis can be made using cells scraped from the inside the cheek.

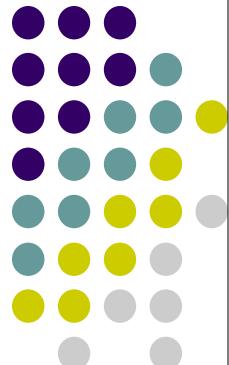
Many cases of PKS may be diagnosed prenatally. Pallister-Killian syndrome is detectable by amniocentesis, a routine test offered in pregnancies suspected to be at risk for chromosome problems. Pallister-Killian syndrome may be suspected when certain physical abnormalities are detected on an ultrasound during pregnancy. In pregnancies where Pallister-Killian syndrome has been diagnosed in an unborn baby, many ultrasounds have shown an increased amount of fluid around the baby, in addition to other physical abnormalities, including short arms and legs, heart malformations, diaphragmatic hernia, cystic hygroma, and unusually flat profile of the face.

### Treatment:

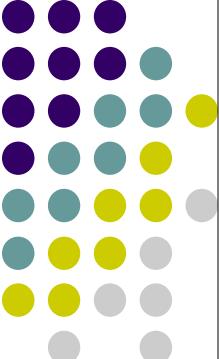
There is no treatment or cure for PKS, or for the mental retardation and developmental delays associated with this syndrome. Persons with PKS are treated for the symptoms they display. Individuals with Pallister-Killian syndrome will often take medications for seizures; some may have surgeries due to birth defects involving the diaphragm, intestines, anus, kidneys, genitals, or heart. [Physical therapy](#) and [occupational therapy](#) may be helpful for development of muscle tone and reduction of joint fixation.

### Prognosis:

Many infants with PKS die before they are born (*in utero*) or soon after birth. Some affected individuals reaching their 20s have been reported. Many have severe to profound mental retardation and very few self-care skills. A few reports have described affected persons with milder intellectual impairment.



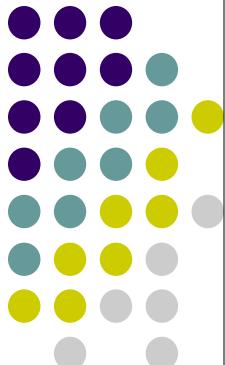
# Trisomy 1

<b>Trisomy 1q</b>	
<b>Summary:</b> Duplication of the long arm of chromosome 1 associated with a variable phenotype, including psychomotor retardation, craniofacial malformations, and various limb, heart, and urogenital anomalies.	
<b>Head and neck:</b> Midface hypoplasia, frontal bossing, microretrognathia, macrocephaly, large fontanelles, asymmetry of posterior fossa, widely spaced open cranial sutures, and facial capillary nevi.	
<b>Ears:</b> Low-set malformed and posteriorly rotated ears	
<b>Eyes:</b> Downslanting palpebral fissures and occasional coloboma of the iris, hypertelorism, narrow palpebral fissures, retinal dysplasia, microphthalmia, optic nerve coloboma, and cataract.	
<b>Nose:</b> Long beaked nose with flat and broad bridge and long philtrum.	
<b>Mouth and oral structures:</b> Occasional microstomia and cleft lip and/or palate.	
<b>Neck:</b> Short neck with excessive skin folds.	
<b>Thorax:</b> Pes cavus. Shield chest.	
<b>Abdomen:</b> Omphalocele in some cases. Omphalocele and diaphragmatic eventration.	
<b>Pelvis:</b> Narrow pelvis.	
<b>Hand and foot:</b> Variable abnormalities include long and thin fingers, hyperextension of hands and feet, small hands, contractures of the fingers, bifid thumbs, syndactyly, dorsal flexion of the feet, pes equinovarus, and camptodactyly.	
<b>Extremities:</b> Bowing of the arms and hip dislocation.	
<b>Spine:</b> Kyphoscoliosis.	
<b>Skin:</b> Wrinkling.	
<b>Skin appendages:</b> Hirsutism or sparse dry hair may be associated.	
<b>Nervous system:</b> Hydrocephalus, brain atrophy, enlarged ventricles, cyst of posterior cranial fossa, and hypoplasia of the cerebellum.	
<b>Cardiovascular system:</b> Ventricular septal defect, tetralogy of Fallot, and patent ductus arteriosus.	
<b>Gastrointestinal system:</b> Absence of gallbladder, duodenal atresia, and duodenal malrotation may occur.	
<b>Urogenital system:</b> Cryptorchidism, short chorda penis, kidney agenesis, and hypoplastic genitalia.	
<b>Lymphatic system:</b> Thymus hypoplasia or aplasia.	
<b>Growth and development:</b> Growth, speech, and mental retardation.	
<b>Behavior and performance:</b> Asphyxia neonatorum.	
	
<b>Trisomy 1p</b>	
<b>Summary:</b> Duplication of the long arm of chromosome 1 with growth and mental deficiency, microcephaly, highly arched cleft palate, facial abnormalities, and brachydactyly.	
<b>Head and neck:</b> Microcephaly, micrognathia, and receding forehead.	
<b>Ears:</b> Prominent ears.	
<b>Eyes:</b> Blepharoptosis and hypertelorism.	
<b>Nose:</b> Depressed nasal bridge.	
<b>Mouth and oral structures:</b> Highly arched cleft palate.	
<b>Abdomen:</b> Umbilical hernia.	
<b>Hand and foot:</b> Brachydactyly and clinodactyly of the fifth finger.	
<b>Nervous system:</b> Seizures.	
<b>Cardiovascular system:</b> Congenital heart defect.	
<b>Urogenital system:</b> Cryptorchidism.	
<b>Growth and development:</b> Growth and mental retardation.	

# Trisomy 10

## Summary:

Chromosome 10, distal trisomy 10q is an extremely rare chromosomal disorder in which the end (distal) portion of the long arm (q) of one chromosome 10 (10q) appears three times (trisomy) rather than twice in cells of the body. The disorder is characterized by unusually slow growth before and after birth (prenatal and postnatal growth retardation); abnormally diminished muscle tone (hypotonia); severe mental retardation; and severe delays in the acquisition of skills requiring coordination of mental and muscular activities (psychomotor retardation). Affected infants and children may also have distinctive malformations of the head and facial (craniofacial) area; defects of the hands and/or feet; and/or skeletal, heart (cardiac), kidney (renal), and/or respiratory (pulmonary) abnormalities. The range and severity of symptoms and physical findings may vary from case to case, depending upon the exact length and location of the duplicated portion of chromosome 10q. In most cases, chromosome 10, distal trisomy 10q is due to a chromosomal balanced translocation in one of the parents.



# Trisomy 13

## Summary:

Trisomy 13 syndrome is a disorder of human chromosomes which occurs in approximately 1 in 10,000 live born infants. Trisomy 13 is due to the presence of an extra #13 chromosome. Approximately 80% of infants with Trisomy 13 syndrome will have a full trisomy while the remainder will have a trisomy due to a rearrangement called a translocation or have mosaicism (two different cell lines).

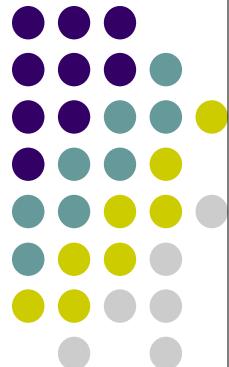
Infants born with Trisomy 13 have a recognizable pattern of physical features that often allow the health professional to make the diagnosis of the syndrome. Notable physical birth defects and sometimes, anatomic changes of internal organs are present. Findings of significance include small head size (microcephaly); small eyes (microphthalmia) or sometimes absent eye or faulty development of the retina. Cleft lip or cleft palate or both occur in about 60% of children. In addition, there are a number of less medically significant physical findings that are helpful in diagnosis. These include variations of ear shape, changes on the palm of the hand, and extra fingers and toes. Changes in foot development, including changes to the heel, the so-called rocker bottom foot, can occur.

## Signs and Symptoms:

About 80% of children with Trisomy 13 will have a congenital heart defect. These can include: ventricular septal defect – an opening between the lower chambers of the heart which prevents the heart from pumping blood correctly (a heart murmur is generally heard from this finding); atrial septal defect – an opening between the two upper chambers of the heart making it difficult for the heart to pump sufficient oxygen rich blood to body tissues (a heart murmur is often heard); patent ductus arteriosus – a defect involving the lack of closure of the channel that usually closes near the time of birth; dextrocardia – location of the heart on the right side of the chest; on occasion more medically serious heart defects can occur in Trisomy 13.

The major implications of Trisomy 13 involve a predisposition to congenital malformations (birth defects) mentioned above, an increased mortality in infancy, and a developmental disability in older children. In addition, older infants can have visual difficulties because of the findings mentioned above and a hearing loss. The increased mortality is related to difficulties with breathing due to either interrupted breathing (apnea), or problems of lung development. In addition, gastroesophageal reflux and feeding problems can occur and predispose to aspiration adding to this risk. Usually the heart defects are not serious enough to be a major health threat in the newborn period.

- Omphalocele 10%
- Holoprosencephaly 60% (an anatomic defect of the brain involving failure of the forebrain to divide properly)
- Kidney defects 30%
- Skin defects of the scalp 20%
- feeding difficulties
- gastroesophageal reflux
- slow post natal growth
- apnea
- seizures
- hypertension
- kidney defects
- developmental disabilities
- scoliosis

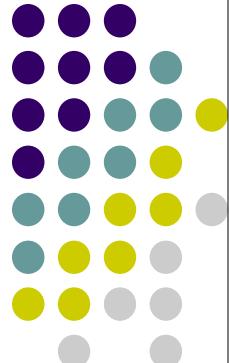


# Trisomy 18

## Summary:

Trisomy 18 syndrome is a disorder of human chromosomes which occurs in approximately 1 in 6,000 live born infants. Trisomy 18 is due to the presence of an extra #18 chromosome. Over 90% of infants with Trisomy 18 syndrome will have a full trisomy while the remainder will have a trisomy due to a rearrangement called a translocation or have mosaicism (two different cell lines).

Infants born with Trisomy 18 usually have small size at birth. There is a recognizable pattern of physical features that often allow the health professional to make the diagnosis of the syndrome. These physical findings are not medically significant but provide clues. They include: prominence to the back part of the head, short eyelid fissures, small mouth and jaw, external ear variations, clenched fist with index finger overlapping the third and 5th finger overlapping the 4th, small fingernails, underdeveloped or altered thumbs, short sternum (breastbone), club feet and redundant skin at the back of the neck.



## Signs and Symptoms:

The congenital malformations involve the medically and significant findings mentioned above as well as the presence of some internal or external birth defects. The most common and important is a defect of the heart. Over 90% of children with Trisomy 18 will have a congenital heart malformation; these include: ventricular septal defect – an opening between the lower chambers of the heart which prevents the heart from pumping blood correctly (a heart murmur is generally heard from this finding); atrial septal defect – an opening between the two upper chambers of the heart making it difficult for the heart to pump sufficient oxygen rich blood to body tissues (a heart murmur is often heard); patent ductus arteriosus – a heart defect involving the lack of closure of the channel that usually closes near the time of birth. This then is a persistence of the opening of this channel. In addition, children with Trisomy 18 usually have an alteration of one of the four heart valves. This combination is referred to as a ventricular septal defect with polyvalvular dysplasia. About 10% of children with Trisomy 18 will have a life threatening heart defect noted before or soon after birth. These include a double outlet right ventricle and hypoplastic left heart.

The increased occurrence of infant mortality is related to a combination of factors but most importantly central apnea, where the brain does not give the message to breathe. Other complicating factors include difficulty feeding with aspiration with a predisposition to aspiration pneumonia, and under development of the lungs. The heart defects can play some role in this but are usually not the only cause of this increased mortality. Important and common birth defects seen in Trisomy 18:

- Congenital heart defects 90%
- Multiple joint contractures 10%
- spina bifida
- hearing loss >50%
- radial aplasia (underdevelopment or missing radial bone of forearm) 5-10%
- cleft lip 5-10%
- birth defects of the eye 10%
- feeding difficulties
- gastroesophageal reflux
- slow post natal growth
- apnea
- seizures
- kidney defects
- urinary tract infections
- developmental disability
- scoliosis

# Trisomy 4q

**Summary:** Duplication of the long arm of chromosome 4 with delayed development, craniofacial abnormalities, limb defects, and variable neurological, ophthalmological, urogenital and other anomalies.

**Head and neck:** Microcephaly, micrognathia, prominent sloping forehead, pointed chin with dimples, and prominent metopic suture.

**Ears:** Malformed posteriorly angulated and low-set ears with prominent antroclines.

**Eyes:** Hypertelorism, bushy eyebrows, strabismus, narrow downslanting palpebral fissures

**Nose:** Shallow nasal bridge with straight nasofrontal angle, short philtrum, and epicanthal folds.

**Mouth and oral structures:** Downturned corners of the mouth.

**Neck:** Short neck.

**Abdomen:** Umbilical or inguinal hernia.

**Hand and foot:** Rockerbottom feet, thumb deformities, syndactyly, and abnormal dermatoglyphics.

**Spine:** Scoliosis.

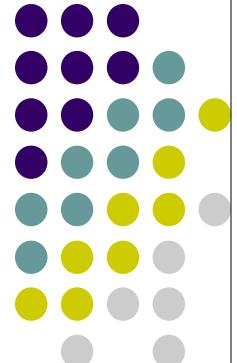
**Muscles:** Hypertonia or hypotonia.

**Nervous system:** Epileptic seizures.

**Cardiovascular system:** Tetralogy of Fallot, venous return anomalies, and heart murmur.

**Urogenital system:** Horseshoe kidney, renal hypoplasia, urethro-vesical reflux, and cryptorchidism.

**Growth and development:** Growth, motor, and mental retardation.



# Trisomy 8

## Warkany Syndrome

**Summary:** Trisomy of chromosome 8 with retarded psychomotor development, long and narrow trunk, dysmorphic facies with blank expression, musculoskeletal defects, eye anomalies, and visceral and other abnormalities.

**Head and neck:** Expressionless facies, micrognathia, and prominent forehead.

**Ears:** Large dysplastic ears with prominent anthelices and large sometimes low-set lobules.

**Eyes:** Deeply set eyes, microphthalmia, strabismus, hypertelorism, corneal opacity, cataract, heterochromia, and downslanting palpebral fissures.

**Nose:** Broad upturned nose.

**Mouth and oral structures:** Everted lips, highly arched or cleft palate, and stretched lingual frenulum.

**Neck:** Short sometimes webbed neck.

**Thorax:** Pectus carinatum.

**Hand and foot:** Camptodactyly, clinodactyly, and short metacarpal and metatarsal bones. Deep palmar and plantar furrows, low ridge count, large number of associations of both arches and whorls on the fingertips, and high palmar and plantar pattern intensity are the dermatoglyphic findings.

**Extremities:** Absent or dysplastic patellae, multiple joint contractures, coxa valga, and abnormal diaphyses and epiphyses of radial, femoral, and humeral bones.

**Spine:** Kyphoscoliosis, hemivertebrae, fusion of vertebrae, spina bifida, and broad dorsal ribs.

**Nervous system:** Occasional agenesis of corpus callosum.

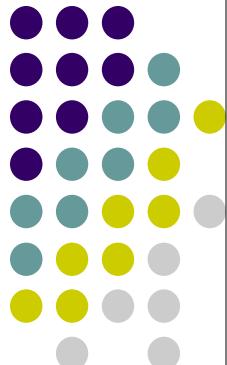
**Cardiovascular system:** Septal defects and great vessel anomalies.

**Urogenital system:** Hydronephrosis, ureteral reflux, cryptorchidism, and malrotation or absence of gallbladder.

**Growth and development:** Speech, moderate mental, and occasional growth retardation.

**Heredity:** Complete trisomy 8 is a frequent cause of first trimester abortions. Live-born infants usually have trisomy 8 mosaicism (XXY or XX/XXY mosaicism) Some cases are associated with tetraploidy and trisomy 21.

**Additional features:** Elongated thin trunk with narrow shoulders, chest, and pelvis. Thin elongated trunk.



# Trisomy 9

**Summary:** Presence of an additional (third) chromosome in an otherwise diploid chromosome 9 with psychomotor retardation and multiple abnormalities of the craniofacial structures, heart, skeletal system, extremities, and other organs. Includes mosaic trisomy 9 syndrome.

**Head and neck:** Microcephaly, prominent occiput micrognathia, wide cranial sutures and fontanelles, craniosynostosis, facial cleft and cloverleaf skull.

**Ears:** Low-set malformed ears.

**Eyes:** Short and upslanting palpebral fissures, microphthalmia, coloboma, corneal clouding, hypertelorism, and deeply set eyes.

**Nose:** Bulbous tip.

**Mouth and oral structures:** Tongue abnormalities, ankyloglossia, cleft and protruding thin arched lip, and cleft or dysplastic palate.

**Neck:** Short and webbed.

**Hand and foot:** Dysplasia of hands and feet, rockerbottom feet, overlapping fingers, camptodactyly, abnormal hand positioning, and talipes. Dermatoglyphic changes include deep palmar and plantar creases.

**Extremities:** Hip dislocation, abnormally shaped long bones, limitation of joint movement, and short limbs.

**Skin appendages:** Hyperconvex nails.

**Nervous system:** Dandy-Walker cyst, subependymal cysts, and ventricular dilatation of the brain.

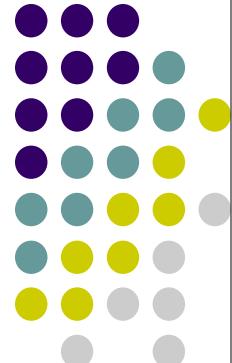
**Cardiovascular system:** Ventricular septal defect, atrial septal defect, patent ductus arteriosus, valve defects, double outlet right ventricle, persistent left superior vena cava, and endocardial fibroelastosis.

**Urogenital system:** Hydronephrosis, duplication of collecting system, microcystic kidneys, dysplastic kidneys, cryptorchidism, small penis, hypospadias, and hypoplastic labia.

**Temporal features:** Most affected patients die during infancy or early childhood.

**Growth and development:** Growth and mental retardation.

**Behavior and performance:** Failure to thrive.



# Tuberous Sclerosis

## Summary:

Tuberous sclerosis is a group of two genetic disorders characterized by problems with the skin, brain/nervous system, and kidneys, and a predisposition to tumors. The diseases are named after a characteristic abnormal growth in the brain, which takes the shape of a tuber or root.

## Causes, Risk Factors, Incidence:

Tuberous sclerosis is inherited as an autosomal dominant trait (only one parent must pass on the bad gene for the child to get the disease). However, a high percentage of cases are due to new mutations (which occur in the sperm or egg of one of the parents), so there usually is no family history of the disease.

## Symptoms:

- Ash leaf spots of skin, and less often, cafe-au-lait spots
- Shagreen spots of the skin, if present, likely on the back
- Red, highly vascular lumps on the face (adenoma sebaceum)
- Mental retardation
- Seizures
- Rough growths under or around fingernails and toenails
- Pitted dental enamel
- Kidney tumors

## Signs and Tests:

- Examination of the eyes may show retinal abnormalities, pale patches, mulberry [tumor](#) or phakoma or [astrocytoma](#) (tumor).
- There may be some indications of heart abnormalities including [abnormal heart rhythm](#) (electrocardiogram) or tumor (rhabdomyoma) on ultrasound.
- An MRI of the head demonstrates tumors or benign "tubers" in the brain.
- A CAT scan of the head may reveal calcium deposits in the brain.
- The mouth may show rubbery growths in tongue or gingiva.
- Ultrasound of kidney may show cysts, fatty benign tumors or serious tumors.
- Ultraviolet light examination of the skin may show ash leaf spots not visible in ordinary light.
- There may be a family history of the condition. [Genetic testing](#) for either of two genes that can cause this disease (TSC1 or 2) may be available.

## Treatment:

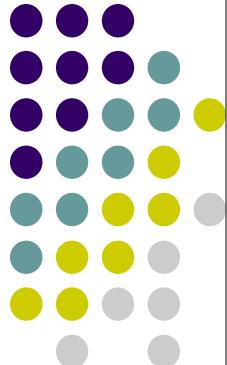
There is no specific treatment for tuberous sclerosis. Treatment is tailored to the symptoms. Medications are required for controlling seizures, which is often difficult. Special schooling or care is determined by the severity of mental retardation.

Adenoma sebaceum (small growths) on the face may be removed by laser treatment. These lesions tend to recur and repeat treatments will be necessary.

Heart tumors called rhabdomyomas commonly disappear after puberty so surgery is usually not necessary. Regular ultrasound of kidneys is important screening for adults to make sure tumors do not grow.

## Prognosis:

Children with mild tuberous sclerosis usually do well. Occasionally, a severely affected child will be born, the parents are examined, and one of them is found to have had a mild case of tuberous sclerosis that escaped detection. Children with profound retardation or uncontrollable seizures usually do poorly. Although numerous benign tumors occur in this disease, some, such as renal or brain tumors, can become malignant.



# Turner's Syndrome

## Summary:

[Turner syndrome](#) is a [genetic condition](#) that occurs only in females. Female cells normally have two X chromosomes. In Turner syndrome, the girl's cells are missing an X chromosome, or part of an X chromosome. There are a variety of signs and symptoms that can result, but the most common are [short height](#), lack of developing ovaries, and [infertility](#).

## Causes, Risk Factors, Incidence:

Humans have 46 chromosomes, which contain all of a person's genes and DNA. Two of these chromosomes, the sex chromosomes, determine a person's gender. Both of the sex chromosomes in females are called X chromosomes. (This is written as XX.) Males have an X and a Y chromosome (written as XY). The two sex chromosomes help a person develop fertility and the sexual characteristics of their gender.

In Turner syndrome, the girl does not have the usual pair of two complete X chromosomes. The most common scenario is that the girl has only one X chromosome in her cells. Some girls with Turner syndrome do have two X chromosomes, but one of the X chromosomes is incomplete. In another scenario, the girl has some cells in her body with two X chromosomes, but other cells have only one.

Turner syndrome occurs in about 1 out of 2,000 live births.

## Symptoms:

Possible symptoms include a combination of:

- Short height
- Webbed neck
- Drooping eyelids
- A "shield-shaped", broad, flat chest
- Absent or incomplete development at puberty, including sparse pubic hair and small breasts
- Infertility
- Dry eyes
- [Absent menstruation](#)
- Absent normal moisture in vagina; [painful intercourse](#)

## Signs:

Turner syndrome can be diagnosed at birth or during childhood, puberty, or adulthood. It can be diagnosed before birth if a karyotype is performed as part of prenatal testing.

During a [physical examination](#), the doctor will look for signs of underdeveloped breasts and genitalia, webbed neck, [short stature](#), low hairline in back, [simian crease](#) (a single crease in the palm), and [abnormal bone development](#) of the chest.

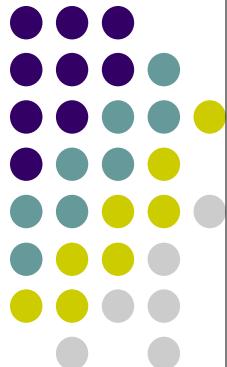
Infants with Turner syndrome often have swollen hands and feet. This is probably from changes in the drainage of the lymphatic system.

## Treatment:

- Growth hormone may be considered to help a child with Turner syndrome grow taller.
- [Estrogen](#) therapy is often started at 12 or 13 years old to stimulate the development of breasts, pubic hair, and other sexual characteristics.
- Donor egg programs are available for women with Turner syndrome who wish to become pregnant.

## Prognosis:

Those with Turner syndrome can have a normal lifespan and productive life when carefully monitored by their physician.



# Vater Syndrome

## with limb anomalies

### Summary:

VATER association describes a pattern of related birth defects in the same infant involving three or more of the following: vertebrae (spine), anus and rectum, heart, trachea (windpipe), esophagus, radius (bone of the arm), and kidneys. Infants can have any combination of features and there is a wide range of severity. Survival and medical complications depend on the extent and severity of features in each case.

### Diagnosis:

Some features of VATER can be seen on **prenatal ultrasound** so that the diagnosis may be suspected at birth. Ultrasound can see differences of the vertebrae, heart, limbs, limb positions, kidneys, and some reproductive parts. Other problems that are associated with VATER on ultrasound are **poor fetal growth**, excessive fluid in the womb, absent or collapsed stomach, and one artery in the umbilical cord instead of the usual two. VATER features that cannot be seen on ultrasound are differences of the anus, esophagus, and trachea.

Even if VATER is suspected before birth, an infant must be examined after birth to determine the extent of features. The entire pattern of internal and external differences will determine if the infant has VATER association, another multiple **birth defect** syndrome, or a genetic syndrome (such as Holt-Oram syndrome, TAR syndrome, or Fanconi anemia). Since VATER overlaps with some genetic syndromes, some infants may fit the VATER pattern and still have another diagnosis. VATER only describes the pattern of related birth defects. Since the genetic causes of VATER are unknown, **genetic testing** is not available. A family history focusing on VATER features can help to determine if an infant has a sporadic case or a rare inherited case.

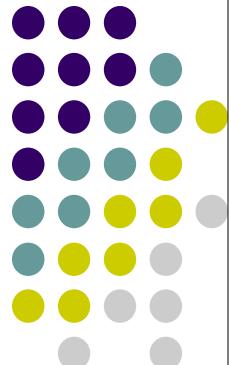
### Signs and Symptoms:

VATER has six defining symptoms. "V" represents vertebral abnormalities. Approximately 70% of individuals with VATER have some type of spine difference such as **scoliosis** (curvature of the spine), hemivertebrae (unusually aligned, extra, or crowded spinal bones), and sacral absence (absence of spinal bones in the pelvic area). Vertebral differences are usually in the lumbro-sacral area (the part of the spine in the small of the back and pelvis). "A" represents **anal atresia** which is present in about 80% of individuals with VATER. This is an unusual arrangement or connection of the anus and rectum. **Imperforate anus** is also common, in which the anal opening does not form or is covered. Babies with this problem cannot pass bowel movements out of the body. "TE" stands for tracheo-esophageal fistula. About 70% of babies with VATER have this problem. This is a connection between the two tubes of the throat—the esophagus (carries food from mouth to stomach) and the trachea (windpipe). This connection is dangerous because it causes breathing problems. These babies can also get food into their windpipe and **choke**. Lung infections are also common with this connection. Some infants may be missing part of their esophagus, causing problems with choking and feeding. These babies spit up their food because the food cannot get to the stomach.

In the original VATER association, "R" stood for radial differences and renal (kidney) problems. The radius is the forearm bone that connects to the hand on the side of the thumb. Radial differences can include an absent or underdeveloped radius. This often results in a twisted, unusual position of the arm and hand. The thumb can also be small, misplaced, or absent. Kidney problems are present in about half of individuals with VATER. These can include missing kidneys, kidney cysts, or fluid buildup in the kidneys. Some individuals also have an abnormal position of the urethra (the tube that carries urine out of the body).

**Prognosis:** (for more information, visit <http://www.healthline.com/galecontent/vater-association/4>)

Prognosis for individuals with VATER association depends on the severity of features. Infants with complex heart problems or severe abnormalities of the anus, trachea, or esophagus have a poorer prognosis. Infants with several features that require surgery have a higher death rate than infants that need minor surgery or no surgery. Survival also depends on how quickly internal problems are discovered. The sooner problems with the heart, anus, trachea, and esophagus are found and repaired, the better the outlook for the infant. One study estimated that infants with VATER have a death rate 25 times higher than healthy infants. Another study estimated that up to 30% of individuals with VATER die in the newborn period.



# Velo-cardio-facial Syndrome

## Summary:

Velocardiofacial syndrome (VCFS) is a disorder that has been associated with over thirty different features. (A disease or disorder that has more than one identifying feature or symptom is a syndrome.) The name velocardiofacial syndrome comes from the Latin words "velum" meaning palate, "cardia" meaning heart and "facies" having to do with the face. Not all of these identifying features are found in each child who is born with VCFS. The most common features are cleft palate (opening in the roof of the mouth), heart defects, characteristic facial appearance, minor learning problems and speech and feeding problems. Although VCFS is the most common syndrome associated with a cleft palate, it was not recognized until 1978, at which time Dr. Robert J. Shprintzen of the Center for Craniofacial Disorders at the Montefiore Medical Center in Bronx, New York, described 12 children with the disorder. Most or all of these first 12 children were born with a cleft palate, heart defects and similar faces. VCFS may also be known as Shprintzen syndrome, DiGeorge syndrome, Craniofacial syndrome or Conotruncal Anomaly Unusual Face Syndrome.

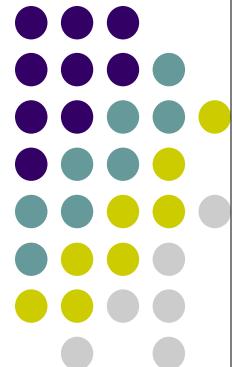
## Causes:

The cause of VCFS is unknown. What is known is that it is a genetic disorder. This means that there is a problem with one or more of the genes which are found in every cell of the body that contain the instructions that tell cells what to do. Although the gene or genes that cause VCFS have not been identified, most of the children who have been diagnosed with this syndrome are missing a small part of chromosome 22. Chromosomes are threadlike structures found in every cell of the body. Each chromosome contains hundreds of genes. A human cell normally contains 46 chromosomes (23 from each parent). The location or address of the missing segment in individuals with VCFS is 22q11. As a result of this deletion, some of the genes are absent from this chromosome.

Scientists and physicians know that VCFS is an autosomal dominant disorder. This means that only one parent needs to have the gene for VCFS in order to pass it along to their children. When one of the parents has VCFS the chance of their children having the syndrome is 1 in 2 or about 50/50 for each birth. Research has revealed, however, that VCFS is inherited in only about 10 to 15 percent of the cases. In most instances, neither of the parents has the syndrome or carries the defective gene and the cause of the deletion is unknown.

## Signs and Symptoms

Despite the involvement of a very specific portion of chromosome 22, there is great variation in the features of this syndrome. At least 30 different problems have been associated with the 22q11 deletion. None of these problems occur in all cases. The list includes: cleft palate, usually of the soft palate (the roof of the mouth nearest the throat which is behind the bony palate); heart problems; similar faces (elongated face, almond-shaped eyes, wide nose, small ears); learning difficulties; eye problems; feeding problems that include food coming through the nose (nasal regurgitation) because of the cleft palate; middle-ear infections (otitis media); hypoparathyroidism (low levels of the parathyroid hormone that can result in seizures); immune system problems which make it difficult for the body to fight infections; weak muscles; short height; curvature of the spine (scoliosis); and tapered fingers. Children are born with these features which do not worsen with age.



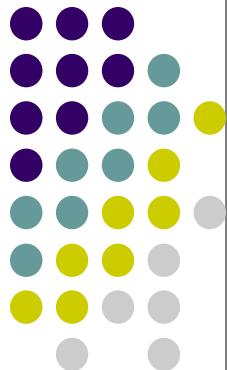
# Waardenburg Syndrome

## Summary:

Waardenburg syndrome is a group of hereditary conditions characterized by deafness and partial albinism (pale skin, hair, and eye color).

## Causes:

Waardenburg syndrome is inherited as an autosomal dominant trait, meaning only 1 parent has to pass on the gene for a child to be affected. There are 4 types of this syndrome. Type 3 is known as Klein-Waardenburg syndrome. Type 4 is Waardenburg-Shah syndrome.



## Symptoms:

- Family history of parent with Waardenburg syndrome
- Extremely pale blue eyes or eye colors that don't match (heterochromia )
- White forelock of hair or early graying of the hair
- Deafness (variable degree)
- Possible slight decrease in intellectual functioning
- Occasional cleft lip
- Constipation
- Possible difficulty with completely straightening joints (contracture)

## Signs:

- Lateral displacement of inner canthi (corners of eye)
- Eyebrows flare in the midline
- Broad nasal bridge
- Deafness
- Pale-to-white portions of eye, including back of the eye
- Small or under-developed bones of the face
- White patches of skin

## Treatment:

No specific treatment is available for Waardenburg syndrome. Attention must be paid to any hearing deficits, and hearing aids and appropriate schooling may be needed. Type 4 patients with constipation require special attention to diet and medications to keep their bowels moving.

## Prognosis:

With correction of hearing deficits, affected people should be able to lead a normal life.

# Werdnig-Hoffman

## Summary:

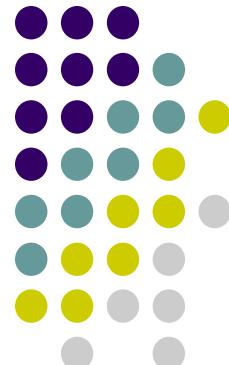
Werdnig Hoffmann disease is a type of spinal muscular atrophy. It is a rare, inherited progressive neuromuscular disorder of infancy characterized by degeneration of groups of nerve cells (motor nuclei) within the lowest region of the brain (lower brainstem) and certain motor neurons in the spinal cord (anterior horn cells). Motor neurons are nerve cells that transmit nerve impulses from the spinal cord or brain (central nervous system) to muscle or glandular tissue.

Approximately 80% of SMA falls into the severe category (SMA1). Infants with SMA1 experience severe weakness before 6 months of age, and the patient never achieves the ability to sit independently when placed. Muscle weakness, lack of motor development and poor muscle tone are the major clinical manifestations of SMA1. Infants with the gravest prognosis have problems sucking or swallowing. Some show abdominal breathing in the first few months of life. Muscle weakness occurs on both sides of the body and the ocular muscles are not affected. A twitching of the tongue is often seen. Intelligence is normal. Most affected children die before 2 years of age but survival may be dependent on the degree of respiratory function.

For infants who appear to develop normally during the first months of life, muscles of the pelvic, trunk, and shoulder areas may initially appear to be disproportionately affected. With disease progression, diminished muscle tone and weakness may gradually spread to affect almost all voluntary muscles, with the exception of certain muscles controlling movements of the eyes.

Infants with Werdnig Hoffmann disease may lack head control, may be unable to roll over or support their weight, and tend to lie relatively still, with little or no movement (flaccid paralysis). In addition, they may develop difficulties sucking, swallowing, and breathing; have an increased susceptibility to respiratory infections; or develop other complications that may lead to potentially life-threatening abnormalities within the first months or years of life. For infants who appear to have normal development for several months prior to the onset of muscle weakness, the disorder may tend to have a more slowly progressive course.

Werdnig Hoffmann disease is inherited as an autosomal recessive trait. Molecular genetic testing has revealed that all types of autosomal recessive SMA are caused by mutations in the SMN (survival motor neuron) gene on chromosome 5. Deletion of the NAIP (neuronal apoptosis inhibitory protein) gene that is close to the SMN gene is also associated with SMA. More patients with Werdnig Hoffman disease (SMA1) than other types of SMA have NAIP deletions. The relationship between specific mutations in the SMN gene and nearby genes and the severity of SMA is still being investigated so classification of SMA subdivisions is based on age of onset of symptoms as opposed to the genetic profile.



# William's syndrome

## (Williams-Beuren syndrome)

### Summary:

Williams syndrome is a [genetic disorder](#) characterized by mild [mental retardation](#), distinctive facial appearance, problems with calcium balance, and [blood vessel disease](#).

### Causes:

Williams syndrome is a genetic disorder characterized by [developmental delay](#), unusual facial appearance, narrowing of the aorta (large artery that leaves the heart) and particular cognitive and personality profiles.

### Symptoms:

- mild-to-moderate mental retardation
- [short stature](#) relative to family
- feeding problems including [colic](#), reflux, [vomiting](#) (due to [low muscle tone](#) and poor gag reflex)
- joint laxity that may progress to stiffness as patient gets older
- developmental delay
- initially delayed speech development may turn into relatively loquacious speech later and relatively strong learning by hearing
- distractibility, attention deficit (ADD)
- learning disorders, for example poor visual-spatial abilities
- blood vessel narrowing including: supravalvular [aortic stenosis](#), pulmonary stenosis, and pulmonary artery stenosis
- [pectus excavatum](#) (sunken chest)
- clinodactyly (an inward bend of the small finger)
- personality traits include being overtly friendly, trusting strangers, fear of loud sounds or physical contact, and an affinity for music

### Signs and Tests:

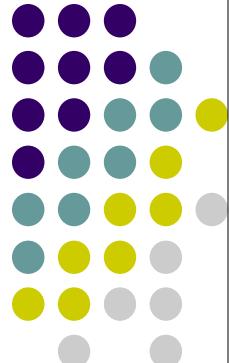
- prominent lips with an open mouth
- flattened nasal bridge with small upturned nose
- epicanthal folds
- long philtrum (midline from upper lip margin to lower nose)
- unusual pattern in iris ("stellate" or star-like)
- partial absence of the teeth, defective tooth enamel, or small, widely-spaced teeth
- [heart failure](#) (depending on degree of heart defect)
- high blood calcium level, [hypercalcemia](#), that may cause seizures and muscle rigidity
- [hypertension](#) (high blood pressure), depending on degree of blood-vessel narrowing
- [echocardiography](#) with [Doppler](#) (may show blood vessel narrowing)
- periodic blood pressure check
- kidney [ultrasound](#) (some patients have renal defects)
- blood test for chromosome deletion that is called a FISH test (genetic defect found in 99% of patients with Williams syndrome)
- far-sightedness

### Treatment:

There is no cure for Williams syndrome. Supplemental calcium and [vitamin D](#) should be avoided. It is important to treat high levels of blood calcium if present. The blood vessel narrowing can be a significant health problem and is treated based on severity. [Physical therapy](#) is helpful to patients with joint stiffness. Developmental and speech therapy can also help these children; for example, their verbal strengths can help compensate for other weaknesses. Other treatments are individualized based on a particular patient's symptoms. Coordination of treatment by a geneticist experienced with Williams syndrome can be beneficial.

### Prognosis:

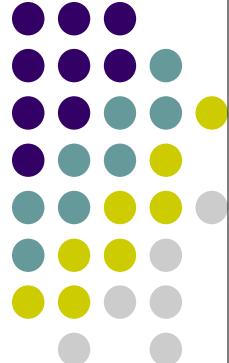
Some degree of mental retardation is found in about 75% of patients with Williams syndrome. Most patients have a shortened life expectancy, due to complications. The majority of patients do not live independently of care givers.



# Wolf-Hirschhorn Syndrome

## Summary:

Wolf-Hirschhorn syndrome (WHS) refers to a condition that is caused by a missing part (deletion) of the short arm of **chromosome 4**. This missing genetic material results in severe developmental retardation, a characteristic facial appearance, and may include a variety of other birth defects.



## Signs and Symptoms:

- slow growth before birth
- slow growth after birth (postnatal growth deficiency)
- small head size (microcephaly)
- weak cry in infancy
- poor muscle tone (hypotonia)
- seizures
- severe developmental retardation
- severe retardation of motor skills
- crossed eyes (Strabismus)
- widely spaced eyes (hypertelorism)
- droopy eyelids (ptosis)
- skin folds in the corner of the eyes (epicanthal folds)
- cleft lip and/or palate
- short upper lip and philtrum
- small chin (micrognathia)
- asymmetry of the skull (cranial asymmetry)
- skin tag or pit in front of the ear (preauricular tag or pit)
- downturned mouth
- prominent triangular area of the forehead (glabella)
- scalp defects on the center of the back of the head
- underdeveloped fingerprints (dermal ridges)
- a single crease across the palm of the hands (Simian crease)
- misaligned bones in the front part of the foot/clubfoot (talipes equinovarus)
- turned up fingernails
- urinary opening on the underside of the penis (hypospadias)
- undescended testicles (cryptorchidism)
- dimple at the base of the spine
- heart defects
- curvature of the spine (scoliosis)
- underdeveloped bones of the hands and pelvis

## Prognosis:

Infants who have WHS may be stillborn or die in the newborn period and prognosis during the newborn period depends upon what birth defects are present. It has been estimated that approximately 35% of individuals who have WHS die within the first two years of life. Many individuals who have WHS survive to adulthood. Universally, children with WHS have severe or profound developmental retardation, however, there are many affected individuals who are able to walk and some that are able to talk in short sentences. It is evident that many patients seem to proceed farther than was previously thought possible. The actual lifespan for individuals who have WHS is unknown, although there are several individuals who have WHS who are in their 20–40s.

# National Organizations

Agenesis of the Corpus Callosum	<a href="http://www.corpuscallosum.org">www.corpuscallosum.org</a>	Fragile X	<a href="http://www.fragilex.org/">www.fragilex.org/</a>
Albinism	<a href="http://www.albinism.org">www.albinism.org</a>	Glaucoma w/ Visual Impairment	<a href="http://www.glaucoma.org">www.glaucoma.org</a>
Amyoplasia Congenita Disruptive Sequence	<a href="http://www.rarediseases.org">http://www.rarediseases.org</a>	Hearing Loss > 20 db	<a href="http://www.nidcd.nih.gov/">www.nidcd.nih.gov/</a>
Anencephaly	<a href="http://www.ashelp.com">www.ashelp.com</a>	Hemiparesis	<a href="http://www.chasa.org/">www.chasa.org/</a>
Angelman's Syndrome	<a href="http://www.angelman.org">www.angelman.org</a>	Holoprosencephaly	<a href="http://www.holoprosencephaly.net">www.holoprosencephaly.net</a>
Anophthalmia	<a href="http://www.anophthalmia.org">www.anophthalmia.org</a>	Hydrocephaly	<a href="http://www.hydrocephalus.org/">www.hydrocephalus.org/</a>
Arginosuccinic Aciduria	<a href="http://www.asakids.org">www.asakids.org</a>	Incontinentia Pigmenti	<a href="http://imgen.bcm.tmc.edu/IPIF/">http://imgen.bcm.tmc.edu/IPIF/</a>
Arthrogryposis	<a href="http://www.rarediseases.org">www.rarediseases.org</a>	Infantile Spasms	<a href="http://www.rarediseases.org">www.rarediseases.org</a>
Athetoid Cerebral Palsy	<a href="http://www.ucp.org">www.ucp.org</a>	Kabuki Syndrome	<a href="http://www.kabukisyndrome.com">www.kabukisyndrome.com</a>
Auditory Neuropathy	<a href="http://www.nidcd.nih.gov/">www.nidcd.nih.gov/</a>	Karsch-Neugebauer Syndrome	<a href="http://www.rarediseases.org">www.rarediseases.org</a>
Autism Spectrum Disorder	<a href="http://www.autism.org">www.autism.org</a>	Klinefelter Syndrome	<a href="http://klinefeltersyndrome.org/">http://klinefetersyndrome.org/</a>
Bilateral Optic Nerve Coloboma	<a href="http://www.nidcd.nih.gov/">www.nidcd.nih.gov/</a>	Krabbe Disease	<a href="http://www.rarediseases.org">www.rarediseases.org</a>
Bilateral Retinal Detachment w/ Blindness	<a href="http://www.nidcd.nih.gov/">www.nidcd.nih.gov/</a>	Larsen Syndrome	<a href="http://www.rarediseases.org">www.rarediseases.org</a>
Bilateral Visual Acuity $\leq$ 20/70 corrected vision best eye	<a href="http://www.nidcd.nih.gov/">www.nidcd.nih.gov/</a>	Leber's Congenital Amaurosis	<a href="http://www.nidcd.nih.gov/">www.nidcd.nih.gov/</a>
Birthweight $\leq$ 1200g or $\leq$ 28 weeks gestational age	<a href="http://www.marchofdimes.com/">www.marchofdimes.com/</a>	Lennox-Gastaut Syndrome	<a href="http://www.epilepsy.org">www.epilepsy.org</a>
Carpenter Syndrome	<a href="http://carpentersyndrome.com/">http://carpentersyndrome.com/</a>	Lissencephaly	<a href="http://www.lissencephaly.org">www.lissencephaly.org</a>
Cataracts with Visual Impairment	<a href="http://www.nidcd.nih.gov/">www.nidcd.nih.gov/</a>	Lowe Syndrome (oculo-cerebro-renal)	<a href="http://www.lowesyndrome.org">www.lowesyndrome.org</a>
Cerebral Palsy/Static Encephalopathy	<a href="http://www.ucp.org">www.ucp.org</a>	Miller-Dieker Syndrome	<a href="http://www.madisonsfoundation.org">www.madisonsfoundation.org</a>
Charge Association	<a href="http://www.chargesyndrome.org/">www.chargesyndrome.org/</a>	Mobius Sequence	<a href="http://www.moebiussyndrome.com">www.moebiussyndrome.com</a>
Citrulinemia	<a href="http://www.nucdf.org">www.nucdf.org</a>	Mosaic Trisomy 8	<a href="http://lists.topica.com/lists/mosaictrisomy8/?cid=2952">http://lists.topica.com/lists/mosaictrisomy8/?cid=2952</a>
Coffin-Lowry Syndrome	<a href="http://clsf.info/">http://clsf.info/</a>	MPS	<a href="http://www.mpssociety.org">www.mpssociety.org</a>
Cornelia De Lange	<a href="http://www.cdlsusa.org/">www.cdlsusa.org/</a>	MSUD (Maple Syrup)	<a href="http://www.msud-support.org">www.msud-support.org</a>
Cortical Blindness	<a href="http://www.nidcd.nih.gov/">www.nidcd.nih.gov/</a>	Myelodysplasia	
Cri du chat	<a href="http://ghr.nlm.nih.gov/condition=criduchatsyndrome">http://ghr.nlm.nih.gov/condition=criduchatsyndrome</a>	Myotonic Dystrophy	<a href="http://www.myotonicdystrophy.org">www.myotonicdystrophy.org</a>
Cystinosis	<a href="http://www.cystinosis.org/">www.cystinosis.org/</a>	Myotubular Myopathy	<a href="http://www.mtmrg.org">www.mtmrg.org</a>
Dandy Walker Malformation	<a href="http://www.rarediseases.org">www.rarediseases.org</a>	Neural Tube Defects	<a href="http://www.ibis-birthdefects.org">Www.ibis-birthdefects.org</a>
Down Syndrome	<a href="http://www.ndss.org/">www.ndss.org/</a>	Opitz Syndrome	
Encephalocele	<a href="http://www.rarediseases.org">www.rarediseases.org</a>	Optic Nerve Atrophy	
Fetal Alcohol Syndrome	<a href="http://www.cdc.gov/ncbdd/fas/">www.cdc.gov/ncbdd/fas/</a>	Ornithine-Carbamyl-Transferase Deficiency	<a href="http://www.nucdf.org">www.nucdf.org</a>

## National Organizations (continued)

Osteogenesis Imperfecta	<a href="http://www.oif.org">www.oif.org</a>	Trisomy 9	<a href="http://www.trisomy9.org">www.trisomy9.org</a>
Pachygyria	<a href="http://www.lissencephaly.org">www.lissencephaly.org</a>	Trisomy 13	<a href="http://www.trisomy.org">www.trisomy.org</a>
Pallister-Killian Syndrome	<a href="http://pks-support.org">http://pks-support.org</a>	Trisomy 18	<a href="http://www.trisomy18.org">www.trisomy18.org</a>
Pervasive Development Disorder (PDD)	<a href="http://www.autism-pdd.org">www.autism-pdd.org</a>	Tuberous Sclerosis	<a href="http://www.tsalliance.org">www.tsalliance.org</a>
PKU	<a href="http://www.pkunews.org">www.pkunews.org</a>	Turner Syndrome	<a href="http://www.turner-syndrome-us.org">www.turner-syndrome-us.org</a>
Prader-Willi Syndrome	<a href="http://www.pwsausa.org">www.pwsausa.org</a>	Vater Syndrome	<a href="http://www.vaterconnection.org">www.vaterconnection.org</a>
Propionic Acidemia	<a href="http://www.pafoundation.com">www.pafoundation.com</a>	Velio-Cardio-Facial	<a href="http://www.vcfsef.org">www.vcfsef.org</a>
ROP (retinopathy of prematurity)	<a href="http://www.lowvision.org">www.lowvision.org</a>	Werdnig-Hoffman Syndrome	See Spinal Muscular Atrophy
Retinitis Pigmentosa	<a href="http://www.blindness.org">www.blindness.org</a>	Williams Syndrome	<a href="http://www.williams-syndrome.org">Www.williams-syndrome.org</a>
Retinoblastoma	<a href="http://www.retinoblastomasolutions.org">www.retinoblastomasolutions.org</a>	Wolf-Hirschhorn Syndrome	<a href="http://www.4p-supportgroup.org">Www.4p-supportgroup.org</a>
Schizencephaly	<a href="http://www.schizkidzbuddies.com">Www.schizkidzbuddies.com</a>		
Seckel Syndrome	<a href="http://www.hgfound.org">www.hgfound.org</a>		
Septo-Optic Dysplasia	<a href="http://www.disabilityresources.org">www.disabilityresources.org</a>		
Severe Attachment Disorder			
Severe Sensorineural HL	<a href="http://www.scsdb.k12.sc.us">www.scsdb.k12.sc.us</a>		
Shaken Baby Syndrome	<a href="http://www.dontshake.com">www.dontshake.com</a>		
Smith-Magenis Syndrome	<a href="http://www.smithmagenis.org">www.smithmagenis.org</a>		
Spina Bifida	<a href="http://www.sbaa.org">www.sbaa.org</a>		
Spinal Cord Injury	<a href="http://www.spinal-cord.org">www.spinal-cord.org</a>		
Spinal Muscular Atrophy	<a href="http://www.smasupport.com">www.smasupport.com</a>		
Stickler Syndrome	<a href="http://www.sticklers.org">www.sticklers.org</a>		
Tar Syndrome	<a href="http://www.ivh.se/TAR">Www.ivh.se/TAR</a>		
Tay-Sachs Disease	<a href="http://www.ntsad.org">www.ntsad.org</a>		
Tetrasomy 12p Syndrome	<a href="http://www.tetrasomy.com">www.tetrasomy.com</a>		