How did this happen?

UPD14 usually arises shortly after conception when a fertilised egg with trisomy 14 (three chromosome 14s) tries to self correct. The trisomy may result from the failure of chromosomes in either the egg or sperm to separate. When the pregnancy tries to correct the trisomy, there is a 50:50 chance that the embryo will retain two copies of chromosome 14 from the same parent - UPD.

Some people with UPD14 also have cells with trisomy 14 alongside UPD cells. This probably explains the variable effects of UPD14.

In UPD14 the trisomy occurs especially often with a chromosome arrangement known as a Robertsonian translocation. The long arm of another chromosome (usually 13 or 21, less commonly 15 or 22) has fused with the long arm of chromosome 14 and both short arms are lost. When eggs or sperm are formed, the fused chromosomes act as a single unit, causing trisomy in the embryo.

Can this happen again?

UPD14 is rare and unlikely to recur in families where both parents have standard chromosomes. But a parent who carries a Robertsonian translocation runs an increased risk of having another affected child, so prenatal diagnosis should be offered.

How common is uniparental disomy 14 ?

UPD14 appears to be rare, although investigators believe that many cases go unrecognised. In 2002, Japanese researchers summarising what is known about this chromosome disorder, could only find 31 people described in medical journals.

Families say …

T has learned to ride a horse despite being told that she never would and to play the piano. She achieves high academic levels in some areas, has won herself a residential scholarship at university, she owns and drives a car (a very old one), has been on fossil digs, does voluntary work and she has a wonderful sense of humour.

T has maternal UPD 14.

For support,
contact with other families and information
Rare Chromosome Disorder Support Group
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Surrey CR3 5GN, UK
Tel/Fax: **+44 (0) 1883 330766**
info@rarechromo.org
www.rarechromo.org

When you are ready for more information, *Unique* can help. We can answer individual queries and we also publish a full leaflet about the effects of Uniparental Disomy 14.

This information sheet is not a substitute for personal medical advice. Families should consult a medically qualified clinician in all matters relating to genetic diagnosis, management and health. The information is believed to be the best available at the time of publication and the medical content has been verified by Dr Reid Sutton, assistant professor, Department of Molecular and Human Genetics, Baylor College of Medicine and by Unique's Chief Medical Adviser 2004

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Uniparental Disomy 14

What is Uniparental Disomy 14?

Uniparental disomy – UPD - is an unusual chromosome condition with distinctly variable effects. Usually people have 23 pairs of chromosomes in the cells in their body. One chromosome in each pair comes from their mother, the other from their father. In uniparental disomy (UPD), both the chromosomes in one pair come from the same parent. Instead of receiving equal genetic contributions from both parents, your child gets no input from one parent and a double dose of genes from the other.

UPD 14 means both chromosome 14s come from one parent. Many of the differences in UPD 14 depend on whether your child has two copies of chromosome 14 from their mother or their father.

Maternal UPD14

These features are typical for a child with both chromosome 14s from their mother.

- **Short stature, small for dates in pregnancy, small hands and feet, but relatively large head**
- **Slight delay in reaching physical developmental milestones**
- **Normal intellectual ability or mild learning difficulties**
- **Speech delay**
- **Feeding difficulties as a baby**
- **Tendency to overweight after babyhood**
- **Early puberty**
- **Scoliosis (spinal curvature)**
- **High cholesterol levels**
- **Hypotonia (floppiness, low muscle tone) and unusually mobile joints.**

Chromosome 14s in a standard cell

Two chromosome 14s from the mother in maternal UPD14

Development

- **General development** Physical development is delayed but children with maternal UPD14 catch up fully. Hypotonia (low muscle tone, floppiness) is marked in early babyhood, but children usually outgrow it.
  Most children can go on to lead independent lives, marry and have a job. Children with paternal UPD14 are likely to need a sheltered environment as adults.
- **Growth** Short stature is a hallmark of UPD14. The growth delay starts before birth and postnatal growth rate appears to follow the lowest standard growth curves. Growth hormone may add to adult height.
- **Learning** Learning abilities depend on the parent-of-origin of the chromosome 14s. Children with maternal UPD14 have only mild learning difficulties or normal intellectual ability. Children with paternal UPD14 will need more learning support as they will have moderate to severe learning difficulties.
- **Speech** Children with UPD14 usually have speech and language delay, but catch-up may occur at least in children with maternal UPD14.

Medical Concerns

- **Precocious puberty** is consistent in maternal UPD14. Puberty typically starts around age 7 but early signs have been noted in babies. Hormone treatment to suppress ovarian function holds puberty at bay and once treatment stops puberty proceeds normally.
- **Overweight** develops typically from middle childhood. Children are especially fat around the chest and abdomen.
- **Respiratory problems** are severe in paternal UPD14. Many babies require a tracheostomy (a breathing tube inserted into the windpipe) and some require mechanical ventilation.
- **Loose joints** contribute to the delay in physical development. In later childhood, joints may be easily strained and become readily painful and swollen after injury.

How is UPD14 detected?

In pregnancy the first sign may be growth delay of the fetus (baby). In paternal UPD an ultrasound scan may show the typical combination of a hernia in the abdominal wall and a narrow, bell-shaped ribcage. There is usually excess amniotic fluid.
The only signs in a newborn baby with maternal UPD14 may be hypotonia or feeding difficulties. Paternal UPD14 is usually immediately obvious as it causes severe respiratory distress.
Chromosome analysis usually reveals either a normal karyotype (chromosome make-up) or a Robertsonian translocation (see **How did this happen?**). DNA technology is needed to show UPD.

Paternal UPD14

These features are typical for a child with both chromosome 14s from their father.

- **Excess amniotic fluid during the mother's pregnancy**
- **Low birthweight**
- **Small chest and narrow ribcage, causing underdeveloped lungs and severe breathing problems**
- **Short arms and legs**
- **Abdominal wall hernia. A visible ridge of muscle runs from the breastbone to the navel. Surgery may be needed if a hernia develops**
- **Omphalocele. Part of the intestine protrudes at birth through a large hole in the abdomen near the navel**
- **Moderate to severe learning difficulty**
- **Unusual facial features, including small ears, protruding upper lip, small eyes, hairy forehead and short neck.**

Chromosome 14s in a standard cell

Two chromosome 14s from the father in paternal UPD14