

## Introduction

In Canada and other developed countries there has been a steady increase in the number of twins, triplets and more born over the last 25 years. Growth in the rate of multiple births is due primarily to the trend of women delaying parenthood as well as the widespread use of treatments for infertility. Each year, approximately 12,000 multiple-birth babies are born across Canada. While babies are a special gift to a family, parents expecting multiples face very specific challenges during pregnancy, when giving birth and parenting two, three or more children of the same age. It is very important for women at risk of becoming pregnant with more than one baby and for expectant parents of multiples to receive vital and timely information and support to help them feel prepared and at ease with the challenges they may face. Being prepared means knowing the special challenges associated with multiple pregnancy, birth and parenting and what can be done to improve the possibility of a healthier birth outcome and a positive parenting experience.

Multiple-birth biology involves scientific terms that can be difficult to understand. This Fact Sheet will help you to sort through the jargon and to be aware of important facts about twins, triplets or more and the probability of conceiving multiples.

***The content of this document is for information purposes only and does not reflect each person's individual situation. If you have any questions consult your health care providers immediately.***

## 1. Types of Multiples and Zygosity

### What are multiples?

*Multiples* is a general term used to describe twins, triplets, quadruplets or more. One of the first questions most people ask is whether multiples are "identical or non-identical (fraternal)" which are the terms commonly used by the public and the media. "Identical" twins and triplets have the same genes and one twin or triplet child may look almost identical to the other(s).

Non-identical multiples are often not publicly recognized as multiples because they look quite different from one another or are of the opposite sex. The use of the terms *identical*, *non-identical* and *fraternal* are seriously flawed for various reasons explained later in this fact sheet. Experts have replaced those words with a term that is believed to more accurately describe the complexities surrounding the origins of multiples. That term is *zygosity*. Another important term to understand is *chorionicity*. Both terms are defined below.

### What is zygosity?

*Zygosity* is the scientific term used to describe the different types of multiples. In the case of twins, zygosity refers to whether the twins have developed from one zygote (one egg fertilized by one sperm) or from two zygotes (two separate eggs are each fertilized by two different sperm). In the first instance, the twins would be referred to as *monozygotic* (old term: identical). In the second example, the twins would be referred to as *dizygotic* (old term: non-identical or fraternal).

### Why is information related to zygosity so important?

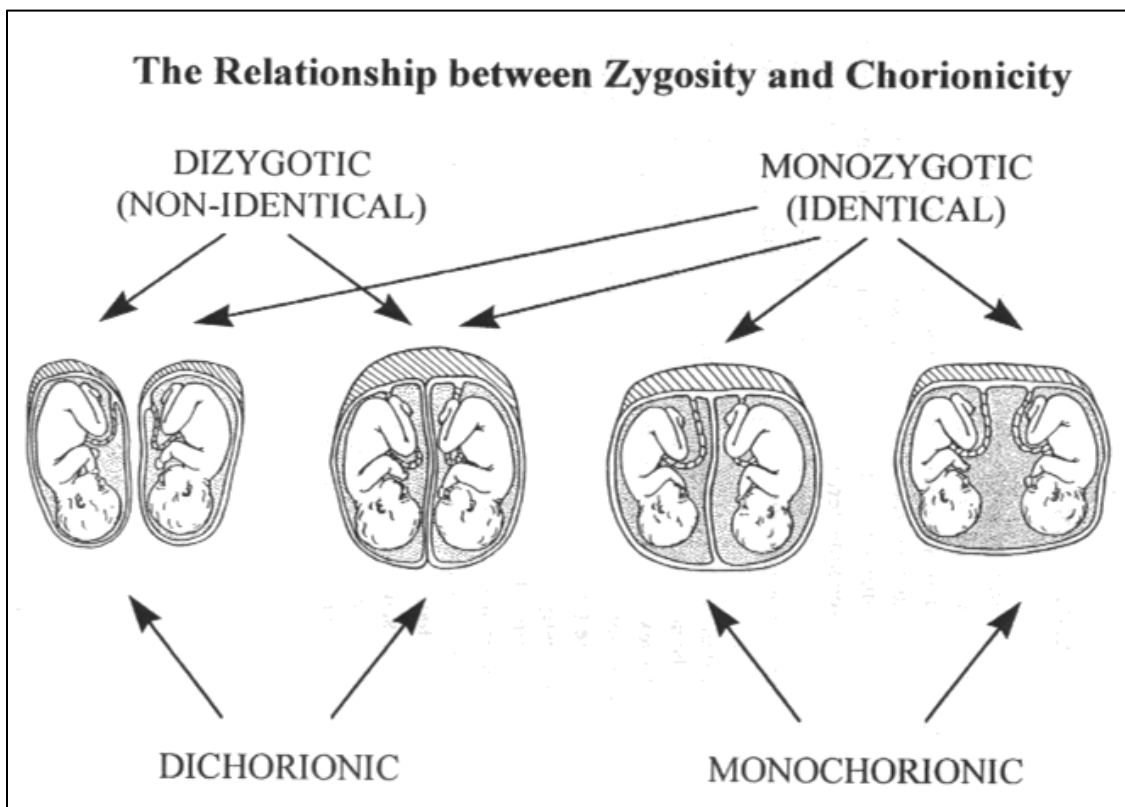
There are a various reasons:

- Medically, this information is vital for pregnancy management and care during birth and childhood.

- It provides essential information for parents and their children to help with the development of the multiples' individuality.
- It assists with genetic counselling:
  - for mothers about the risks of having multiples again
  - for the children if one child has a congenital abnormality or genetically linked disease
- It is needed for any research which involves twins or more.

## What is chorionicity?

*Chorionicity* is a medical term used to describe *monochorionic* multiples that develop in the same placenta (chorion) and *dichorionic* multiples that develop within their own separate placenta. *Monochorionic* and *dichorionic* multiples develop in the following ways:



- A zygote, which looks like a round mass, begins to divide rapidly to form a cluster of cells.
- The inner group of cells will become the embryo or fetus (baby).
- The outer group of cells will become the two membranes that nourish and protect the embryo.
- The outer membrane is called the chorion and is part of the placenta.
- The inner membrane, the amnion, surrounds and protects the embryo.

- In **dizygotic twin pregnancies**, each baby has its own chorion and there are two placentas and two amnions.
- With **monozygotic twin pregnancies** there are three possibilities:
  - Each baby has its own placenta, chorion and amnion
  - Both babies share a single placenta and chorion but have separate amnions.
  - Both babies share a single placenta and chorion and an amnion—they are in one sac.

## Why is information about chorionicity important?

This information is important because multiples that share a placenta have greater risks of complications, mainly *Twin to Twin Transfusion Syndrome* (TTTS). (See the *Monochorionic Multiple Pregnancy and Twin to Twin Transfusion Syndrome* fact sheet.) If the multiples have one placenta as well as one inner sac (amnion) there is a risk of the umbilical cords of the babies becoming entangled. It is therefore most important that multiple pregnancies be diagnosed as early as possible, and chorionicity be determined through ultrasound by 12-14 weeks so that a specific obstetrical care plan can be followed.

## What are monozygotic (MZ) multiples?

- MZ multiples result from the splitting of a single fertilized egg during the first two weeks after conception.
- These multiples are usually genetically alike but not necessarily identical.
- They may look slightly different due to differences in nutrition and position in the uterus, birth experience, illness or other events before or after birth. These factors can make the size and shape of the head and face different but features such as the eye and hair colour, shape of the hands, feet and ears will be very similar.
- It is not uncommon for one MZ twin to be right-handed and the other left-handed, otherwise known as mirror-imaging or mirror image twins.
- Triplets (or more) can be MZ when one zygote divides into three. The famous Canadian Dionne quintuplets are MZ multiples.

## What are dizygotic (DZ) multiples?

- DZ multiples are produced from the fertilization of two different eggs by two different sperm.
- They can be either the same or of different sex.
- Genetically they are no more alike than any other siblings.
- They may look very similar or quite different.

## Are there other types of multiples?

- Genetic research shows that there are “in-between” types of multiples. Experts believe this may be more common than we realize. Because of advanced methods of DNA analysis, we now know that within some pairs of twins each twin shares the genetic contribution from the mother but *different* genetic contributions from the father. It is proposed that instead of an egg splitting after it is fertilized by one sperm, an egg may split prior to fertilization and each half is fertilized by a different sperm.

- Another rare occurrence is the fusion of the placentas of DZ in-vitro fertilized embryos. Although the babies share a placenta (MC), they are actually DZ.

## What are Higher Order Multiples (HOM)?

*Higher order multiples* is the term used for births involving three or more babies (e.g. triplets, quadruplets, quintuplets):

- Most HOM's are *polyzygotic* meaning multiple fetuses produced by two or more fertilized eggs (zygotes). There can be many variations of zygosity within a HOM multiple set. For example, a set of triplets can consist of two MZ children and one DZ child. In this example, there were two zygotes but one of the zygotes subsequently divides into two. Now, there are three embryos, two of which are monozygotic.
- *Trizygotic* (TZ) is the technical term used to describe triplets resulting from three eggs fertilized by three separate sperm.
- *Quadrazygotic* (QZ) is the technical term to describe quadruplets resulting from four eggs fertilized by four separate sperm.
- TZ or QZ higher order multiples are no more genetically alike than singleton siblings.

## How will I know the zygosity of my multiple-birth children?

- Ultrasound scans in early pregnancy (by 14 weeks) determine whether each fetus has his/her own placenta, chorion and amnion or whether they share a placenta, chorion or even an amnion. The scan identifies how many placentas there are and looks at the thickness of the membranes that separate each of the multiples.
- If there is one chorion surrounding two or more babies, this is referred to as monochorionic. These babies are MZ.
- If it is determined that each twin fetus has its own placenta, chorion and amnion, they are referred to as dichorionic. The twins could be MZ or DZ; accurate determination is made at birth or after.
- If each multiple has a placenta of his/her own, these placentas may stay separate in different parts of the uterus, or, if they are close, they will possibly fuse into one placental mass. One cannot assume that multiples with separate or fused placentas are DZ.
- DZ multiples
  - Multiples of the opposite gender are always DZ
  - DZ multiples always have separate placentas, although these placentas are sometimes fused together
- MZ multiples
  - About one-third of MZ multiples have two placentas, and two-thirds share one placenta.
  - At least 1% of MZ multiples share the same amniotic sac and are referred to as monoamniotic.
- Often, the determination of zygosity of same-sex multiples has to wait until birth or after the births. A careful examination of the placenta(s) and membranes (chorion and amnion) **may** reveal zygosity. Only DNA testing can accurately determine the zygosity of same-sex multiples.

## 2. Probability of Having Multiples

### What are my chances of having a multiple pregnancy and/or birth?

The probability of spontaneously conceiving twins, triplets or more varies according to *zygosity*:

- The factors associated with *DZ multiples* are the mother's age at the time of conception, the history of multiples on the female side of the mother's family, race and the number of previous pregnancies.
- The factors leading to spontaneous *MZ multiples* are generally unknown but there may be a tendency in certain families.
- *MZ multiples* occur all over the world at a constant rate of about 3.5 per births per 1000 births, regardless of race.
- Approximately one half of same-sex multiples are *MZ* and one half are *DZ*.

### How do Spontaneous Multiple Pregnancies Occur?

Possible ways include:

- A woman releases more than one egg during ovulation and each egg is fertilized by a different sperm resulting in *DZ multiples*.
- A woman releases one egg during ovulation, it is fertilized with one sperm and then spontaneously splits into two resulting in *MZ multiples*. Sometimes the splitting occurs again with resulting *MZ triplets* or *quadruplets*.

### How is the mother's age a factor?

- Multiple births are more frequent among women in their thirties and forties.
- Over half of multiple-birth babies are born to women age 30 and older.

### Does Fertility Treatment increase my chance of having multiples?

- Yes. All fertility treatments involving drugs that stimulate ovulation or procedures that implant multiple embryos in the mother increase the risk of multiples.
- The intention of fertility treatments is to produce a singleton pregnancy and birth. In spite of this, even when a single embryo is transferred, it is possible that the embryo will split resulting in *MZ twins*. If two embryos are implanted, it is possible that one or both may split resulting in *triplets* or *quadruplets*.
- Women undergoing treatments for infertility are about 20 times more likely to have a multiple pregnancy than women who conceive multiples spontaneously. The risks vary depending on the type of treatment.
- Overall, about 35-45% of all multiple pregnancies result from fertility treatments. However, approximately 80% of higher order multiples are a consequence of these treatments.

### Are multiples hereditary?

- Yes. If you have a family history of spontaneous *DZ multiples* on your mother's or your maternal grandmother's side, you have an increased chance of conceiving multiples.
- There is also recent evidence to suggest that *MZ twinning* may be inherited in certain families.

- It is a myth that twins typically skip a generation. Many multiples themselves have multiples.

## What other factors increase the probability of having multiples?

- **Having More Multiples** - Once you have had a multiple pregnancy, you are two to three times more likely to conceive and deliver multiples again, especially if they were DZ.
- **Maternal Weight and Height** - Women with above average weight and height before pregnancy (body mass index (BMI) of 30 or greater) have an increased risk of conceiving DZ multiples
- **Race affects the odds** - Black women have the highest incidence of multiples, mostly DZ; far Eastern Asian women have the lowest incidence; and Caucasians and Asian Indian women fall in between the two.
- **Family size** - The more children you already have, the greater the mother's chance of conceiving DZ multiples in a subsequent pregnancy.

## Recommended Sources of Information:

Multiple Births Canada  
[www.multiplebirthscanada.org/english/higherorder.php](http://www.multiplebirthscanada.org/english/higherorder.php)  
Toll-Free (in Canada): 1-866-228-8824  
Telephone: 613-834-TWIN(8946)  
Email: [office@multiplebirthscanada.org](mailto:office@multiplebirthscanada.org)

The Multiple Births Foundation  
[www.multiplebirths.org.uk/](http://www.multiplebirths.org.uk/)  
Telephone: 0208 383 3519 Fax: 0208 383 3041  
E-mail: [info@multiplebirths.org.uk](mailto:info@multiplebirths.org.uk)

One At A Time - [www.oneatitime.org.uk](http://www.oneatitime.org.uk)

Twin to Twin Transfusion Syndrome Foundation  
[www.ttsfoundation.org](http://www.ttsfoundation.org)

International Society for Twin Studies  
[www.ists.qimr.edu.au](http://www.ists.qimr.edu.au)

Multiple Births: Prenatal Education & Bereavement Support- [www.multiplebirthsfamilies.com](http://www.multiplebirthsfamilies.com)

## Documents and Articles:

The Alphabet Soup of Twin Biology by Geoffrey Machin, M.D., Ph.D. (2006)  
[www.twinservices.org/articles/twinbiology.html](http://www.twinservices.org/articles/twinbiology.html)

Information for Parents When Twins Share One Placenta (Multiple Births Foundation, UK)  
[www.multiplebirths.org.uk/MC%20Pregnancy%20%20Version%2012%2017%205%2010.pdf](http://www.multiplebirths.org.uk/MC%20Pregnancy%20%20Version%2012%2017%205%2010.pdf)

Twins, Triplets or More: Resource Guide for Multiple Pregnancy and Parenthood 2011 (Updated every six months) by Linda G. Leonard, RN MSN [www.nursing.ubc.ca/pdfs/twinstriplesandmore.pdf](http://www.nursing.ubc.ca/pdfs/twinstriplesandmore.pdf)

## References:

Belogolovkin, V. & Stone, J (2007). Managing risk—to mother and fetuses—in a twin gestation. *OBG Management*, 19 (7). 66-67; 71-72; 75-79.

Boklage, C.E. (2006). Embryogenesis of chimeras, twins and anterior midline asymmetries. *Human Reproduction*, 21 (3), 579-591.

Bryan, Elizabeth M. (1992). *Twins, triplets and more: Their nature, development and care*. New York: St. Martin's Press.

Bryan, E., Denton, J. & Hallet, F. (1997). *Facts about Multiple Births*. The Multiple Births Foundation, London, England.

Machin, G. (2009). Non-identical monozygotic twins, intermediate twin types, zygoty testing, and the non-random nature of monozygotic twinning: A review. *American Journal of Medical Genetics Part C (Seminars in Medical Genetics) 151C (2)*, 110-127.

Machin, G. (2009). Familial monozygotic twinning: A report of seven pedigrees. *American Journal of Medical Genetics Part C (Seminars in Medical Genetics) 151C (2)*, 152-154.

Machin, Geoffrey A. & Keith, Louis G. (1999). *An Atlas of Multiple Pregnancy, Biology and Pathology*, Parthenon Publishing Group Inc.

Reddy, U. , Branum, A., & Klebanoff, M. (2005). Relationship of maternal body mass index and height to twinning. *Obstetrics & Gynecology, 105 (3)*, 593-59.

Redline, R. (2003). Non-identical twins with a single placenta—Disproving dogma in perinatal pathology. *New England Journal of Medicine, 349 (2)*, 111-114.

Rydholm, H. Twinning in Sweden between 1973 and 1990: The Recurrence Rate. *Early Human Development, 1996*, 51,7-12.

Shur N. (2009). The genetics of twinning: From splitting eggs to breaking paradigms. *American Journal of Medical Genetics Part C (Seminars in Medical Genetics) 151C (2)*:105-109

[Souter V.L.](#) et al (2007). A case of true hermaphroditism reveals an unusual mechanism of twinning. *Human Genetics 121 (2)*:179-185.

Statistics Canada (2011). *Births 2008*. Ottawa: Minister of Industry.

*Twins Magazine, Editors, (1997). The twinship sourcebook: Your guide to understanding multiples*. Twins Magazine Inc.

## Multiple Births Canada

Donna Launslager, 2011

### Expert Reviewers

Jon Barrett, M.B.Bch., FRCOG, MD, FRCSC

Jane Denton, CBE, FRCN, RGN, RM,

Linda Leonard, RN, MSN

Geoffrey Machin, MD, PhD

The Healthy Singleton Birth Committee, Assisted Human Reproduction Canada

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### Questions?

1 (866) 228-8824 (toll free in Canada)  
To order copies, contact:  
[office@multiplebirthscanada.org](mailto:office@multiplebirthscanada.org)  
[www.multiplebirthscanada.org](http://www.multiplebirthscanada.org)

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