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#### **No association was found between exposures to endocrine disruptors in the mother during pregnancy, infant thyroid function, and birth outcomes**

Endocrine disruptors are chemical pollutants in the environment that can affect the action of endocrine glands, including the thyroid gland. Exposure of the mother to endocrine disruptors during pregnancy may affect the baby's thyroid hormone levels and subsequent brain function. This study examined exposure of mothers to endocrine disruptors during pregnancy and subsequent thyroid function in the mother and baby and birth outcomes.

Berg V et al. Persistent organic pollutants and the association with maternal and infant thyroid homeostasis: a multipollutant assessment. *Environ Health Perspect.* May 24, 2016 [Epub ahead of print].

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Plowden TC et al. Subclinical hypothyroidism and thyroid autoimmunity are not associated with fecundity, pregnancy loss or live birth. *J Clin Endocrinol Metab.* March 29, 2016 [Epub ahead of print].

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#### **Effects of thyroid hormone replacement during pregnancy**

Subclinical hypothyroidism is defined as an increased TSH but normal thyroid hormone levels. While it is clear that overt hypothyroidism in the mother during pregnancy can affect the development of the baby, it is less clear about the effects of subclinical hypothyroidism. In some studies there have been links to higher risk for adverse pregnancy outcomes. This study

was done to see if there is a risk of treatment with levothyroxine in patients with subclinical hypothyroidism during pregnancy.

Maraka S et al. Effects of levothyroxine therapy on pregnancy outcomes in women with subclinical hypothyroidism. *Thyroid.* May 16, 2016 [Epub ahead of print].

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#### **Thyroid blood tests and general well-being, mood and brain function**

TSH is opposite to thyroid hormone levels as a lower TSH corresponds to higher thyroid hormone levels. Existing research has been unclear if correcting hypothyroidism with thyroid hormone therapy leads to improved general health and brain abilities. This study was done to examine if thyroid hormone replacement doses at the upper end of the normal range is associated with improved general health and cognitive outcomes.

Samuels M et al. Effect of thyroid function variations within the laboratory reference range on health status, mood and cognition in levothyroxine treated subjects. *Thyroid* 2016 Jun 23. [Epub ahead of print]

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#### **The Afirma Gene Expression Classifier increased the rate of indeterminate thyroid biopsy results and did not decrease surgical rates**

Up to 15–20% of thyroid biopsies are read as being indeterminate, meaning that a diagnosis cannot be determine looking at the cells themselves. Examining molecular markers in biopsy specimens have gained favor in helping to determine need for surgery and even to guide extent of surgery in some cases. This study was done to determine effect of the Afirma Gene Expression Classifier on cytology diagnosis and rate of surgery as well as rate of cancer on indeterminate biopsy results.

Sacks WL et al. Impact of Afirma gene expression classifier on cytopathology diagnosis and rate of thyroidectomy. *Cancer Cytopathol* 2016, Epub

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#### Clinical Thyroidology for the Public

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## CLINICAL **THYROIDOLOGY** FOR THE **PUBLIC**

A publication of the American Thyroid Association

VOLUME 9 • ISSUE 8 • AUGUST 2016

## EDITOR'S COMMENTS

Welcome to another issue of *Clinical Thyroidology for the Public*. In this journal, we will bring to you the most up-to-date, cutting edge thyroid research. We will be providing summaries of research studies that were discussed in a recent issue of *Clinical Thyroidology*, a publication of the American Thyroid Association for physicians. These summaries are present in lay language to allow the rapid dissemination of thyroid research to the widest possible audience. This means that you are getting the latest information on thyroid research and treatment almost as soon as your physicians. As always, we are happy to entertain any suggestions to improve *Clinical Thyroidology for the Public* so let us know what you want to see.

We also provide even faster updates of late-breaking thyroid news through **Twitter** at [@thyroidfriends](https://twitter.com/thyroidfriends) and on **Facebook**. Our goal is to provide patients with the tools to be the most informed thyroid patient in the waiting room.

Also check out our friends in the **Alliance for Thyroid Patient Education**. The Alliance member groups consist of: the *American Thyroid Association*, *Bite Me Cancer*, the *Graves' Disease and Thyroid Foundation*, the *Light of Life Foundation*, *ThyCa: Thyroid Cancer Survivors Association*, *Thyroid Cancer Canada* and *Thyroid Federation International*.

August is [Thyroid and Pregnancy Awareness Month](#).

Come to our free **Thyroid Patient Forum** in Denver, Colorado on September 24, 2017!

In this issue, the studies ask the following questions:

1. Does exposure to environmental pollutants during pregnancy affect the baby's development?
2. Do slightly abnormal TSH levels and positive TPO antibodies before pregnancy affect pregnancy outcomes?
3. Should subclinical hypothyroidism be treated during pregnancy?
4. Does treating hypothyroid adults to achieve a TSH in the lower normal range affect mood or general well-being?
5. Does the use of the Afirma™ GEC in thyroid biopsies reduce the frequency of thyroid surgery?

We welcome your feedback and suggestions. Let us know what you want to see in this publication. I hope you find these summaries interesting and informative.

— Alan P. Farwell, MD, FACE



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**THYROID AND PREGNANCY****No association was found between exposures to endocrine disruptors in the mother during pregnancy, infant thyroid function, and birth outcomes****BACKGROUND**

Endocrine disruptors are chemical pollutants in the environment that can affect the action of endocrine glands. Persistent organic pollutants (POPs) are common environmental chemical exposures that consist of two major classes of compounds: perfluoroalkyl substances (PFAs) and organochlorines (OCs). These chemicals may affect thyroid function by binding to thyroid hormone receptors, interfering with making thyroid hormone in the thyroid gland and interfering with thyroid hormone binding to carrier proteins in the blood. All of these can lead to apparent mild hypothyroidism. Sources of exposures to POPs include diet, air, house dust, drinking water, and water-based beverages. Thyroid hormone plays an essential role in normal brain development. Because of this, there has been increasing interest in exposure of the mother to endocrine disruptors during pregnancy that may affect the baby's thyroid hormone levels and subsequent brain function. This study examined exposure of mothers to POPs during pregnancy and subsequent thyroid function in the mother and baby and birth outcomes.

**THE FULL ARTICLE TITLE**

Berg V et al. Persistent organic pollutants and the association with maternal and infant thyroid homeostasis: a multipollutant assessment. *Environ Health Perspect.* May 24, 2016 [Epub ahead of print].

**SUMMARY OF THE STUDY**

Data were obtained as part of the Northern Norway Mother and Child Contaminant Cohort Study and collected from May 2007 through June 2009 from a population representative of the general Norwegian population. Analyses were performed in 370 mother–child pairs. Serum was collected from the mother once during the second trimester for the measurement of maternal thyroid function and POP concentrations. TSH concentrations in the baby were obtained by heelprick within 3 days after delivery. Infants' weight, head circumference, and length were assessed as birth outcomes.

TPO antibody titers were detected in 22 women, who were included in all analyses. The average TSH of the children (53% male) was 1.2 mIU/L and 4 children had a TSH >5 mIU/L. Serum analyses showed detectable maternal levels of seven PFAs in >80% of the samples, with perfluorooctane sulfonate (PFOS) having the highest levels (average 8.03 ng/ml). Of the OCs, there were measurable levels of eight polychlorinated biphenyls (PCBs) and four pesticides in >80% of the maternal serum samples. The mother's TSH concentrations were directly related to the concentrations of most PFAs and OCs—the higher the POP level, the higher the TSH, suggesting a decrease in the mother's thyroid function due to the POP exposure. The four children with subclinical hypothyroidism (TSH >5 mIU/L) were born to mothers in the highest levels of TSH concentrations and PFOS exposure. In the full group, no significant associations existed either between maternal POP and infant serum TSH concentrations or between maternal POP concentrations and thyroid function with birth outcomes.

**WHAT ARE THE IMPLICATIONS OF THIS STUDY?**

In this Norwegian mother–child paired study of maternal exposures to primarily PFAs and OCs, there were direct associations between pollutant exposures to the mother and a mild decrease in the mother's thyroid function. However, no associations were found between pollutant exposures to the mother, infant serum thyroid function at 3 days of age, and birth outcomes (birth weight, head circumference, and length).

— Alan P. Farwell, MD,

**ATA THYROID BROCHURE LINKS**

Thyroid and Pregnancy: <http://www.thyroid.org/thyroid-disease-pregnancy/>

Hypothyroidism: <http://www.thyroid.org/hypothyroidism/>



**THYROID AND PREGNANCY**, continued

**ABBREVIATIONS & DEFINITIONS**

**Endocrine disruptors:** chemical pollutants in the environment that can affect the action of endocrine glands. Examples include bisphenol A (BPA), polychlorinated biphenols (PCBs), perfluoroalkyl substances (PFAs) and organochlorines (OCs).

**Hypothyroidism:** a condition where the thyroid gland is underactive and doesn't produce enough thyroid hormone. Treatment requires taking thyroid hormone pills.

**Subclinical Hypothyroidism:** a mild form of hypothyroidism where the only abnormal hormone level is an increased TSH. There is controversy as to whether this should be treated or not.





**THYROID AND PREGNANCY****Variation of TSH in the normal range or thyroid autoimmunity is not associated with pregnancy loss or miscarriage****BACKGROUND:**

Lots of research has been done already about the effect of severe and obvious thyroid disease on pregnancy. Severe thyroid disease in the form of overactive (hyperthyroidism) or underactive (hypothyroidism) thyroid problems may cause abnormal monthly periods, difficulty getting pregnancy, miscarriage and pregnancy loss. The most common cause of thyroid problems in the United States is autoimmune thyroid disease, where the body makes antibodies that attack the thyroid to cause hyperthyroidism or hypothyroidism. TPO antibody is one of the marker of autoimmune thyroid disease and previous research studies have shown that high levels of TPO antibodies may increase the chance of miscarriage in pregnant women.

This present study has investigated the possibility of pregnancy loss, miscarriage and a longer time needed to become pregnant in women who do not have severe thyroid disease but may have slightly abnormal TSH levels and positive TPO antibodies before their pregnancies.

**THE FULL ARTICLE TITLE**

Plowden TC et al, Subclinical hypothyroidism and thyroid autoimmunity are not associated with fecundity, pregnancy loss or live birth. J Clin Endocrinol Metab. March 29, 2016 [Epub ahead of print].

**SUMMARY OF THE STUDY**

The study was done in the USA. The information about more than 1000 women who already participated in a different clinical trial from 2007 to 2011 was included in this study. The women in this study were 18 to 40 years of age and all had one or two miscarriages before joining the study, but none of them had any difficulty

becoming pregnant. None had severe thyroid disease. The information about the thyroid related blood tests was obtained from the clinical trial that these women had participated before. The tests were done before they become pregnant and they were TSH, thyroid hormone, Thyroglobulin antibody and TPO antibody.

The result of the study showed that slight changes in TSH or high level of TPO antibody and Thyroglobulin antibody in women who do not have a severe or noticeable thyroid problem does not increase the possibility of pregnancy loss. It also did not take longer for these women to become pregnant and the number of alive babies born from these mothers also was not different.

**WHAT ARE THE IMPLICATIONS OF THIS STUDY?**

This study shows that women with high level of thyroid antibodies and/or a slightly higher TSH level than average population do not have an increase in miscarriage or difficulty getting pregnant. These findings are somewhat different from some of the past studies and should be followed by other large research studies. For now these results show that healthy women with slightly higher TSH which is still within the normal range of most laboratories may not have a higher chance of pregnancy loss and may not benefit from taking thyroid hormone supplements.

— Shirin Haddady, MD

**ATA THYROID BROCHURE LINKS**

Thyroid and Pregnancy: <http://www.thyroid.org/thyroid-disease-pregnancy/>

Thyroid Function Tests: <http://www.thyroid.org/thyroid-function-tests/>

**ABBREVIATIONS AND DEFINITIONS:**

**Autoimmune thyroid disease:** a group of disorders that are caused by antibodies that get confused and attack the thyroid. These antibodies can either turn on the thyroid (Graves' disease, hyperthyroidism) or turn it off (Hashimoto's thyroiditis, hypothyroidism).

**Hypothyroidism:** a condition where the thyroid gland is underactive and doesn't produce enough thyroid hormone. Treatment requires taking thyroid hormone pills.

**THYROID AND PREGNANCY**, continued

**Hyperthyroidism:** a condition where the thyroid gland is overactive and produces too much thyroid hormone. Hyperthyroidism may be treated with antithyroid meds (Methimazole, Propylthiouracil), radioactive iodine or surgery.

**Miscarriage:** this occurs when a baby dies in the first few months of a pregnancy, usually before 22 weeks of pregnancy.

**TPO antibodies:** these are antibodies that attack the thyroid instead of bacteria and viruses, they are a marker for autoimmune thyroid disease, which is

the main underlying cause for hypothyroidism and hyperthyroidism in the United States.

**Thyroglobulin antibodies:** these are antibodies that attack the thyroid instead of bacteria and viruses, they are a marker for autoimmune thyroid disease, which is the main underlying cause for hypothyroidism and hyperthyroidism in the United States.

**TSH: thyroid stimulating hormone** — produced by the pituitary gland that regulates thyroid function; also the best screening test to determine if the thyroid is functioning normally.

Watch this video to learn how you can support the ATA's ongoing research on Differentiated Thyroid Cancer!

ATA: Searching for Answers to Thyroid Cancer



00:05

vimeo

**THYROID AND PREGNANCY****Effects of thyroid hormone replacement during pregnancy****BACKGROUND**

Subclinical hypothyroidism is defined as an increased TSH but normal thyroid hormone levels. While it is clear that overt hypothyroidism in the mother during pregnancy can affect the development of the baby, it is less clear about the effects of subclinical hypothyroidism. However, in some studies there have been links to higher risk for adverse pregnancy outcomes. Guidelines on the treatment of subclinical hypothyroidism during pregnancy differ based on which such patients should be treated. Some guidelines recommend treatment of all patients, others only if the thyroid TPO antibody is positive. This study was done to see if there is a risk of treatment with levothyroxine in patients with subclinical hypothyroidism during pregnancy.

**THE FULL ARTICLE TITLE**

Maraka S et al Effects of levothyroxine therapy on pregnancy outcomes in women with subclinical hypothyroidism. *Thyroid*. May 16, 2016 [Epub ahead of print].

**SUMMARY OF THE STUDY**

Data was collected from 366 patients between January 2011 and December 2013. The women were divided into two groups: 82 women received that received levothyroxine and the rest did not. The investigators looked for poor

outcomes such as pregnancy loss, pre-term delivery and abnormal birth weight among other factors.

The goals for treatment were met in nearly 70% of the women who received levothyroxine replacement. Treatment was linked to a 59 % lower risk for pregnancy loss and 67% lower risk for pre-term delivery. Also, the risk for having low birth weight in the newborn was lower.

**WHAT ARE THE IMPLICATIONS OF THIS STUDY?**

Investigators found a benefit of levothyroxine replacement in pregnancy outcomes in selected women. This study adds more support treat even subclinical hypothyroidism during pregnancy as it may be linked to improved pregnancy outcomes.

—Vibhu Sharma, MD

**ATA THYROID BROCHURE LINKS**

Hypothyroidism: <http://www.thyroid.org/hypothyroidism/>

Thyroid and Pregnancy: <http://www.thyroid.org/thyroid-disease-pregnancy/>

Thyroid Hormone Treatment: <http://www.thyroid.org/thyroid-hormone-treatment/>

**ABBREVIATIONS & DEFINITIONS**

**Subclinical Hypothyroidism:** a mild form of hypothyroidism where the only abnormal hormone level is an increased TSH. There is controversy as to whether this should be treated or not.

**Overt Hypothyroidism:** clear hypothyroidism an increased TSH and a decreased T<sub>4</sub> level. All patients with overt hypothyroidism are usually treated with thyroid hormone pills.

**Thyroid hormone therapy:** patients with hypothyroidism are most often treated with Levothyroxine in order to return their thyroid hormone levels to normal. Replacement therapy means the goal is a TSH in the normal range for pregnancy.

**Levothyroxine (T<sub>4</sub>):** the major hormone produced by the thyroid gland and available in pill form as Synthroid™, Levoxyl™, Tyrosint™ and generic preparations.



## HYPOTHYROIDISM

### Thyroid blood tests and general well-being, mood and brain function

#### BACKGROUND

Patients who have hypothyroidism (an underactive thyroid gland) require thyroid hormone replacement and normal thyroid hormone levels are important for general health and for proper brain functioning. Some symptoms of hypothyroidism are fatigue, decreased energy, slow thinking, weight gain and feeling colder than usual. Thyroid function is usually assessed by a blood tests measuring thyroid stimulating hormone (TSH) levels as well thyroid hormone levels. TSH is opposite to thyroid hormone levels as a lower TSH corresponds to higher thyroid hormone levels and a higher TSH corresponds to lower thyroid hormone levels. While it is clear that thyroid hormone replacement improves most symptoms of hypothyroidism, existing research has been unclear if correcting hypothyroidism with thyroid hormone therapy leads to improved general health and brain abilities. This study was done to examine if thyroid hormone replacement doses at the upper end of the normal range (corresponding to TSH values at the lower end of the normal range) is associated with improved general health and cognitive outcomes.

#### THE FULL ARTICLE TITLE

Samuels M et al. Effect of thyroid function variations within the laboratory reference range on health status, mood and cognition in levothyroxine treated subjects. *Thyroid* 2016 Jun 23. [Epub ahead of print]

#### SUMMARY OF THE STUDY

This was a study of 123 adults from one center, all of whom had hypothyroidism (from various causes) and were taking thyroid hormone replacement medication (levothyroxine). All of the individuals had blood TSH levels in the normal range and no recent changes in their dose of levothyroxine. The subjects were split into two groups: those with a low-normal TSH (0.34–2.5 mIU/) and those with a high-normal TSH (2.51–5.6). Everyone underwent extensive testing to measure their general health status and well-being (by questionnaire),

mood, and cognitive function. The tests for cognitive function focused on executive function (i.e. decision-making) and memory.

The majority of patients in this study were women of all age ranges. The most common reason for taking thyroid hormone was primary hypothyroidism, which includes Hashimoto's hypothyroidism. Overall, there were no associations found between blood TSH levels (all within the normal range) and measures of general health, well-being, mood, and cognitive function. The authors conclude that taking higher amounts of thyroid hormone within the normal range (resulting in lower blood TSH values within the normal range) does not alter these outcomes.

#### WHAT ARE THE IMPLICATIONS OF THIS STUDY?

This study shows that higher doses of thyroid hormone to treat hypothyroidism (corresponding to a lower TSH but still within the normal range) do not necessarily have increased health benefits. Specifically, the participants in this study did not have any differences in general health, general well-being, mood, or brain function. The relationships between thyroid status and hypothyroid symptoms are complex. Further research in this field will be helpful to understand why some patients with hypothyroidism who are treated with thyroid hormone replacement continue to have symptoms.

— Angela M. Leung, MD, MSc

#### ATA THYROID BROCHURE LINKS

Hypothyroidism: <http://www.thyroid.org/hypothyroidism/>

Thyroid Hormone Treatment: <http://www.thyroid.org/thyroid-hormone-treatment/>

Thyroid Function Tests: <http://www.thyroid.org/thyroid-function-tests/>



**HYPOTHYROIDISM**, continued**ABBREVIATIONS & DEFINITIONS**

**Hypothyroidism:** a condition where the thyroid gland is underactive and doesn't produce enough thyroid hormone. Treatment requires taking thyroid hormone pills.

**Hashimotos thyroiditis:** the most common cause of hypothyroidism in the United States. It is caused by antibodies that attack the thyroid and destroy it.

**TSH: thyroid stimulating hormone** — produced by the pituitary gland that regulates thyroid function; also

the best screening test to determine if the thyroid is functioning normally.

**Thyroid hormone therapy:** patients with hypothyroidism are most often treated with Levothyroxine in order to return their thyroid hormone levels to normal. Replacement therapy means the goal is a TSH in the normal range and is the usual therapy.

## Thyroid Awareness Monthly Campaigns

The ATA will be highlighting a distinct thyroid disorder each month and a portion of the sales for Bravelets™ will be donated to the ATA. The month of August is **Thyroid and Pregnancy Awareness Month** and a bracelet is available through the [ATA Marketplace](#) to support thyroid cancer awareness and education related to thyroid disease.





## THYROID NODULES

# The Afirma Gene Expression Classifier increased the rate of indeterminate thyroid biopsy results and did not decrease surgical rates

### BACKGROUND

Thyroid nodules are very common, occurring in up to 50% of the population. The concern with any thyroid nodule is the possibility of thyroid cancer. Thyroid biopsy is the best test to determine if a nodule contains a cancer. However, up to 15–20% of biopsies are read as being indeterminate, meaning that a diagnosis cannot be determined looking at the cells themselves. Traditionally, many of these biopsy results were treated surgically, with a relatively low risk for cancer (5–20%) pre-operatively. Examining molecular markers in biopsy specimens have gained favor in helping to determine need for surgery and even to guide extent of surgery in some cases. One such panel of molecular markers is the Afirma Gene Expression Classifier (GEC). The use of the GEC has been previously shown to decrease need for surgery in patients with indeterminate biopsy results when it returns benign. However, the helpfulness of the GEC has recently been questioned and it has been suggested that it may be over-utilized. This study was done to determine effect of the GEC on cytology diagnosis and rate of surgery as well as rate of cancer on indeterminate biopsy results.

### THE FULL ARTICLE TITLE

Sacks WL et al. Impact of Afirma gene expression classifier on cytopathology diagnosis and rate of thyroidectomy. *Cancer Cytopathol* 2016, Epub

### SUMMARY OF THE STUDY

From 2012–2014, 4292 total thyroid biopsy results were retrospectively studied at Cedars-Sinai Medical Center. The patients had an average age of 58 year, 73.5% were female and the average nodule size was 2 cm. The initial 18 months of the study included biopsies done before the availability of the GEC and these were compared with the last 18 months, when the GEC was used in 45.3% (140) of eligible cases. Of 4292 FNAs performed, 567 nodules

or 13.2% of the total were indeterminate. In the group that could utilize GEC, 140 (45.3%) of the 309 eligible indeterminate results were sent for GEC analysis. Of these, 37.1% had GEC-benign results, 55.7% had GEC-suspicious results, and 7.1% had GEC-No result.

Interestingly, there was an increase in indeterminate cytology results after the GEC became available. A total of 197 (41.6%) of the patients with indeterminate biopsies had thyroid surgery and 31.5% were cancerous. Of the patients with indeterminate results who had a repeat biopsy performed, 35.2% returned with non-indeterminate results, so did not require repeat GEC testing. However, the surgery rate for patients with indeterminate results were not different before and after the introduction of the GEC analysis. Further, the cancer rate in indeterminate nodules was not different with GEC availability either.

### IMPLICATIONS OF THE STUDY

The use of the Afirma GEC previously was shown to decrease the rate of surgery in patients who have GEC-benign results. In contrast, this study did not demonstrate lower surgical rates with the GEC. However it did show that when molecular testing became available, the number of indeterminate biopsy results increased. The rate of cancer and the rate of surgery did not differ with GEC availability in this series. A repeat biopsy led to a more definitive result in 35% of cases, suggesting that this may be an alternative approach to the use of molecular markers in indeterminate nodule cytology.

— Julie Hallanger Johnson, MD

### ATA BROCHURE LINKS

Thyroid Nodules: <http://www.thyroid.org/thyroid-nodules/>

**THYROID NODULES, continued****ABBREVIATIONS & DEFINITIONS**

**Thyroid nodule:** an abnormal growth of thyroid cells that forms a lump within the thyroid. While most thyroid nodules are non-cancerous (Benign), ~5% are cancerous.

**Thyroid fine needle aspiration biopsy (FNAB):** a simple procedure that is done in the doctor's office to determine if a thyroid nodule is benign (non-cancerous) or cancer. The doctor uses a very thin needle to withdraw cells from the thyroid nodule. Patients usually return home or to work after the biopsy without any ill effects.

**Indeterminate thyroid biopsy:** this happens a few atypical cells are seen but not enough to be abnormal (atypia of unknown significance (AUS) or follicular lesion of unknown significance (FLUS)) or when the diagnosis is a follicular or hurthle cell lesion. Follicular and hurthle cells are normal cells found in the thyroid. Current analysis of thyroid biopsy results cannot differentiate between follicular or hurthle cell cancer from noncancerous adenomas. This occurs in 15–20%

of biopsies and often results in the need for surgery to remove the nodule.

**Molecular markers:** genes and microRNAs that are expressed in benign or cancerous cells. Molecular markers can be used in thyroid biopsy specimens to either to diagnose cancer or to determine that the nodule is benign. The two most common molecular marker tests are the Afirma™ Gene Expression Classifier and Thyroseq™

**Genes:** a molecular unit of heredity of a living organism. Living beings depend on genes, as they code for all proteins and RNA chains that have functions in a cell. Genes hold the information to build and maintain an organism's cells and pass genetic traits to offspring.

**microRNA:** a short RNA molecule that has specific actions within a cell to affect the expression of certain genes.



September 21-25, 2016

**86<sup>th</sup> Annual Meeting of the  
American Thyroid Association**DENVER, COLORADO  
[www.thyroid.org](http://www.thyroid.org)

**ATA Alliance for Thyroid Patient Education****GOAL**

The goal of our organizations is to provide accurate and reliable information for patients about the diagnosis, evaluation and treatment of thyroid diseases.

We look forward to future collaborations and continuing to work together towards the improvement of thyroid education and resources for patients.

**WHO WE ARE** (in alphabetical order)

- **American Thyroid Association**
- **Bite Me Cancer**
- **Graves' Disease and Thyroid Foundation**
- **Light of Life Foundation**
- **ThyCa: Thyroid Cancer Survivors' Association, Inc.**
- **Thyroid Cancer Canada**
- **Thyroid Federation International**

**AMERICAN THYROID ASSOCIATION**

[www.thyroid.org](http://www.thyroid.org)

ATA Patient Resources: <http://www.thyroid.org/patients-portal/>

Find a Thyroid Specialist: [www.thyroid.org](http://www.thyroid.org)

Phone (toll-free): 1-800-THYROID

e-mail: [thyroid@thyroid.org](mailto:thyroid@thyroid.org)

**ATA Mission:** The ATA leads in promoting thyroid health and understanding thyroid biology.

**ATA Vision:** The ATA is the leading organization focused on thyroid biology and the prevention and treatment of thyroid disorders through excellence and innovation in research, clinical care, education, and public health.

**ATA Values:** The ATA values scientific inquiry, clinical excellence, public service, education, collaboration, and collegiality.

To further our mission, vision and values the ATA sponsors "Friends of the ATA" online to advance the information provided to patients and the public such as this publication, *Clinical Thyroidology for the Public*. We welcome your support.

*continued on next page*

AMERICAN  
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ASSOCIATION  
FOUNDED 1923

**ThyCa: Thyroid Cancer  
Survivors' Association, Inc.**  
[www.thyca.org](http://www.thyca.org)



**ATA Alliance for Thyroid Patient Education****Continued...****BITE ME CANCER**<http://www.bitemecancer.org>

Bite Me Cancer was formed as a nonprofit foundation in September, 2010, by Nikki Ferraro, who was 17-years old at the time. Nikki was diagnosed with a rare form of thyroid cancer in April 2010 when she was a junior at Chantilly HS in Virginia. Nikki was determined to lead a Relay for Life team just two weeks after her diagnosis. She named the team Bite Me Cancer and experienced immediate success. When Nikki decided to create a foundation a few months later, she wanted to continue the legacy of her team name and thus her foundation became the Bite Me Cancer Foundation.

e-mail: [info@bitemecancer.org](mailto:info@bitemecancer.org)**GRAVES' DISEASE AND THYROID FOUNDATION**[www.gdatf.org](http://www.gdatf.org)

Phone (toll-free): 1-877-NGDF-123 or 643-3123

e-mail: [Gravesdiseasefd@gmail.com](mailto:Gravesdiseasefd@gmail.com)

Founded in 1990, the Graves' Disease Foundation offers support and resources to Graves' disease patients, their families, and health care professionals. Their mission is to find the cause of and the cure for Graves' thyroid disease through research, to improve the quality of life for persons with Graves' disease and their caregivers and to educate persons with Graves' disease, their caregivers, healthcare professionals, and the general public about Graves' disease and its treatment. The web site features a monitored bulletin board.

**LIGHT OF LIFE FOUNDATION**[www.checkyourneck.com](http://www.checkyourneck.com)email: [info@checkyourneck.com](mailto:info@checkyourneck.com)

The Light of Life Foundation, founded in 1997, is a nonprofit organization that strives to improve the quality of life for thyroid cancer patients, educate the public and professionals about thyroid cancer, and promote research and development to improve thyroid cancer care.

*continued on next page*AMERICAN  
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FOUNDED 1923ThyCa: Thyroid Cancer  
Survivors' Association, Inc.<sup>SM</sup>  
[www.thyca.org](http://www.thyca.org)Thyroid Cancer Canada  
Cancer de la thyroïde Canada





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[www.thyroid.org](http://www.thyroid.org)

## ATA Alliance for Thyroid Patient Education

Continued...

### THYCA: THYROID CANCER SURVIVORS' ASSOCIATION, INC.

[www.thyca.org](http://www.thyca.org)

Phone (toll-free): 877 588-7904

e-mail: [thyca@thyca.org](mailto:thyca@thyca.org)

ThyCa: Thyroid Cancer Survivors' Association, Inc., founded in 1995, is an international nonprofit organization, guided by a medical advisory council of renowned thyroid cancer specialists, offering support and information to thyroid cancer survivors, families, and health care professionals worldwide.

### THYROID CANCER CANADA

[www.thyroidcancercanada.org](http://www.thyroidcancercanada.org)

Phone: 416-487-8267

Fax: 416-487-0601

e-mail: [info@thyroidcancercanada.org](mailto:info@thyroidcancercanada.org)

Thyroid Cancer Canada is a non-profit organization founded in 2000. The organization works towards creating an environment in which people who are dealing with thyroid cancer, especially the newly diagnosed, are met with support and information. Their goals & objectives include facilitating communication among thyroid cancer patients, providing credible information about the disease, providing emotional support, and assisting thyroid cancer patients with voicing their needs to health care professionals and those who are responsible for health care policy.

### THYROID FEDERATION INTERNATIONAL

[www.thyroid-fed.org](http://www.thyroid-fed.org)

e-mail: [tfi@thyroid-fed.org](mailto:tfi@thyroid-fed.org)

Thyroid Federation International (TFI) was established in Toronto in 1995. Thyroid Federation International aims to work for the benefit of those affected by thyroid disorders throughout the world by providing a network of patient support organizations.



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September 21-25, 2016

**86<sup>th</sup> Annual Meeting of the American Thyroid Association**

DENVER, COLORADO



[www.thyroid.org](http://www.thyroid.org)

## FREE Public Health Forum – All are welcome

Thyroid experts from the American Thyroid Association and thyroid patients join together to inform the general public, other thyroid patients, and their friends and families about:



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## Thyroid Disease and You

Concerned about low energy?...Memory loss?...Fatigue?...Depression? ...

Rapid heartbeat?...Restlessness?...Infertility?... Weight or hair changes?...

A lump on your neck?... Could it be your thyroid?

**Saturday, September 24, 2016**

**2:30 pm – 4:30 pm**

**Denver, Colorado**

**Location:** Governor's Square 14 Room, Plaza Building, Concourse Level  
**Sheraton Denver Downtown Hotel**  
1550 Court Place, Denver, CO 80202  
Phone: 1-303-893-3333

### Physician experts will discuss thyroid disorders.

This program is free and all are welcome, including walk-in-attendees. Reservations are encouraged to ensure we have enough seating. For more information and to register, please e-mail ThyCa at [thyca@thyca.org](mailto:thyca@thyca.org).

### Who should attend?

Anyone who has had an overactive or underactive thyroid, thyroiditis, a thyroid nodule, thyroid cancer, or a family history of thyroid problems or related disorders, including rheumatoid arthritis, juvenile diabetes, pernicious anemia, or prematurely gray hair (starting before age 30) Please come if you have questions, symptoms, or concerns about a thyroid problem. Receive free educational materials.

### Reservations requested. Walk-ins welcome.

E-mail [thyca@thyca.org](mailto:thyca@thyca.org) to RSVP

(Please indicate in your message the thyroid condition you are most concerned about.)

*Online educational information for patients is provided by all members of the ATA Alliance for Patient Education co-sponsoring this forum: ThyCa: Thyroid Cancer Survivors' Association, Graves' Disease and Thyroid Foundation, Light of Life Foundation, Bite Me Cancer, Thyroid Cancer Canada and Thyroid Federation International. Go online to [www.thyroid.org](http://www.thyroid.org) and click on "Patient Information" to access the resources you need.*

# Join us for the

September 21-25, 2016

## 86<sup>th</sup> Annual Meeting of the American Thyroid Association

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JOIN EXPERTS AND THOUGHT LEADERS IN FIELD OF THYROIDOLOGY TO HEAR INNOVATIVE TALKS, participate in interactive sessions, and network with friends and colleagues at the ATA Annual Meeting. Held at the Sheraton Denver Downtown Hotel in Denver, Colorado, the ATA meeting is open to all health care professionals interested in broadening their knowledge of the thyroid gland and its disorders. The ATA Program Committee led, by Co-Chairs Peter Arvan and Stephanie Fish, have developed a scientific program to satisfy the interests of all audiences.

The Ridgway Trainee Conference, the full-day satellite ultrasound course and focused discussion debate, will be available to accent the robust meeting agenda. Don't miss your opportunity to earn CME credits, develop professionally and foster long lasting connections.

### ATA 2016 CALL FOR ABSTRACT SUBMISSIONS

#### Regular Call:

Site Closed – Wednesday, May 25, 2016

#### Short Call:

Site Opens – Wednesday, July 27, 2016

Site Closes – Wednesday, August 10, 2016

### REGISTRATION and HOUSING OPEN NOW AT [WWW.THYROID.ORG](http://WWW.THYROID.ORG)

Agenda, meeting updates, exhibitor and sponsor opportunities available online.

### SAVE THE DATE FOR THESE UPCOMING ATA MEETINGS:

**87<sup>th</sup> Annual Meeting of the American Thyroid Association** – October 18-22, 2017  
The Fairmont Empress and Victoria Conference Center, Victoria, BC, Canada

**88<sup>th</sup> Annual Meeting of the American Thyroid Association** – October 3-7, 2018  
Marriott Marquis, Washington, DC

**89<sup>th</sup> Annual Meeting of the American Thyroid Association** – October 30-November 3, 2019  
Sheraton Grand Chicago, Chicago, IL

**Spring Meeting of the American Thyroid Association** – May 28-30, 2020  
Westin New York at Times Square, New York, NY



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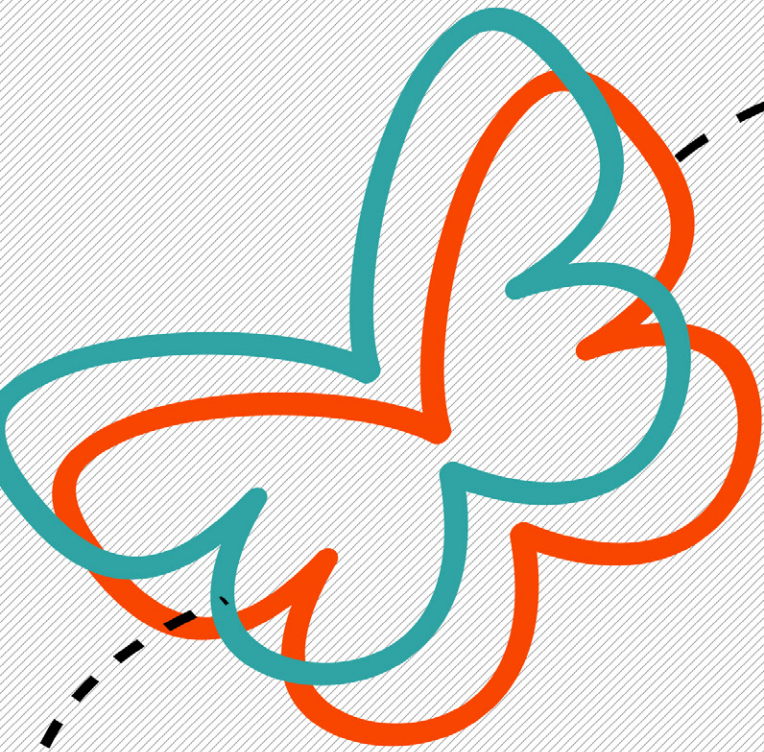
### American Thyroid Association

*Dedicated to scientific inquiry, clinical excellence, public service, education and collaboration*



# Reasons to #GIVE2THYROID

[www.thyroid.org/donate](http://www.thyroid.org/donate)



Reason

1

## Public & Thyroid Patients

The American Thyroid Association® is dedicated to serving as an educational resource for the public by supporting thyroid research and promoting the prevention, treatment and cure of thyroid-related diseases and thyroid cancer. Help support the continuation of our patient/public education programs and resources including:

- +thyroid brochures
- +summarized medical literature
- +endocrinologist referral
- +monthly newsletters
- +support links
- +patient alliance community
- +health and education forums

## Thyroid Physicians, Scientists & Professionals

The American Thyroid Association® provides outstanding leadership in thyroidology by promoting excellence and innovation in clinical management, research, education, and patient care. Help support thyroid specialists and the development of resources that advance our understanding of thyroid disorders and cancer including:

- +clinical practice guidelines
- +position statements
- +early career training
- +research and education grants
- +leadership & service awards
- +community for collaboration
- +continuing education programs
- +peer-review biomedical journals
- +summarized medical literature
- +up to date thyroid news & publications
- +patient education

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# Thyroid Disease and Pregnancy

## WHAT IS THE THYROID GLAND?

The thyroid gland is a butterfly-shaped endocrine gland that is normally located in the lower front of the neck. The thyroid's job is to make thyroid hormones, which are secreted into the blood and then carried to every tissue in the body. Thyroid hormone helps the body use energy, stay warm and keep the brain, heart, muscles, and other organs working as they should.

## WHAT ARE THE NORMAL CHANGES IN THYROID FUNCTION ASSOCIATED WITH PREGNANCY?

**HORMONE CHANGES.** A normal pregnancy results in a number of important physiological and hormonal changes that alter thyroid function. These changes mean that laboratory tests of thyroid function must be interpreted with caution during pregnancy. Thyroid function tests change during pregnancy due to the influence of two main hormones: human chorionic gonadotropin (hCG), the hormone that is measured in the pregnancy test and estrogen, the main female hormone. HCG can weakly turn on the thyroid and the high circulating hCG levels in the first trimester may result in a slightly low TSH (called subclinical hyperthyroidism). When this occurs, the TSH will be slightly decreased in the first trimester and then return to normal throughout the duration of pregnancy (see Table 1). Estrogen increases the amount of thyroid hormone binding proteins in the serum which increases the total thyroid hormone levels in the blood since >99% of the thyroid hormones in the blood are bound to these proteins. However, measurements of "Free" hormone (that not bound to protein, representing the active form of the hormone) usually remain normal. The thyroid is functioning normally if the TSH, Free T4 and Free T3 are all normal throughout pregnancy.

**SIZE CHANGES.** The thyroid gland can increase in size during pregnancy (enlarged thyroid = goiter). However, pregnancy-associated goiters occur much more frequently in iodine-deficient areas of the world. It is relatively uncommon in the United States, which is thought to be relatively iodine-sufficient. If very sensitive imaging techniques (ultrasound) are used, it is possible to detect an increase in thyroid volume in some women. This is usually only a 10-15% increase in size and is not typically apparent on physical examination by the physician. However, sometimes a significant goiter may develop and prompt the doctor to measure tests of thyroid function.

## WHAT IS THE INTERACTION BETWEEN THE THYROID FUNCTION OF THE MOTHER AND THE BABY?

For the first 10-12 weeks of pregnancy, the baby is completely dependent on the mother for the production of thyroid hormone. By the end of the first trimester, the baby's thyroid begins to produce thyroid hormone on its own. The baby, however, remains dependent on the mother for ingestion of adequate amounts of iodine, which is essential to make the thyroid hormones. The World Health Organization recommends iodine intake of 200 micrograms/day during pregnancy to maintain adequate thyroid hormone production. The normal diet in the United States contains sufficient iodine so additional iodine supplementation is rarely necessary.

## HYPERTHYROIDISM & PREGNANCY

### WHAT ARE THE MOST COMMON CAUSES OF HYPERTHYROIDISM DURING PREGNANCY?

Overall, the most common cause (80-85%) of maternal hyperthyroidism during pregnancy is Graves' disease (see *Graves' Disease brochure*) and occurs in 1 in 1500 pregnant patients. In addition to other usual causes of hyperthyroidism (see *Hyperthyroidism brochure*), very high levels of hCG, seen in severe forms of morning sickness (hyperemesis gravidarum), may cause transient hyperthyroidism. The diagnosis of hyperthyroidism can be somewhat difficult during pregnancy, as 123I thyroid scanning is contraindicated during pregnancy due to the small amount of radioactivity, which can be concentrated by the baby's thyroid. Consequently, diagnosis is based on a careful history, physical exam and laboratory testing.

### WHAT ARE THE RISKS OF GRAVES' DISEASE/ HYPERTHYROIDISM TO THE MOTHER?

Graves' disease may present initially during the first trimester or may be exacerbated during this time in a woman known to have the disorder. In addition to the classic symptoms associated with hyperthyroidism, inadequately treated maternal hyperthyroidism can result in early labor and a serious complication known as pre-eclampsia. Additionally, women with active Graves' disease during pregnancy are at higher risk of developing very severe hyperthyroidism known as thyroid storm. Graves' disease often improves during the third trimester of pregnancy and may worsen during the post partum period.





# Thyroid Disease and Pregnancy

## WHAT ARE THE RISKS OF GRAVES' DISEASE/HYPERTHYROIDISM TO THE BABY?

The risks to the baby from Graves' disease are due to one of three possible mechanisms:

### 1) UNCONTROLLED MATERNAL HYPERTHYROIDISM:

Uncontrolled maternal hyperthyroidism has been associated with fetal tachycardia (fast heart rate), small for gestational age babies, prematurity, stillbirths and possibly congenital malformations. This is another reason why it is important to treat hyperthyroidism in the mother.

### 2) EXTREMELY HIGH LEVELS OF THYROID STIMULATING IMMUNOGLOBULINS (TSI):

Graves' disease is an autoimmune disorder caused by the production of antibodies that stimulate thyroid gland referred to as thyroid stimulating immunoglobulins (TSI). These antibodies do cross the placenta and can interact with the baby's thyroid. Although uncommon (2-5% of cases of Graves' disease in pregnancy), high levels of maternal TSI's, have been known to cause fetal or neonatal hyperthyroidism. Fortunately, this typically only occurs when the mother's TSI levels are very high (many times above normal). Measuring TSI in the mother with Graves' disease is often done in the third trimester.

In the mother with Graves' disease requiring antithyroid drug therapy, fetal hyperthyroidism due to the mother's TSI is rare, since the antithyroid drugs also cross the placenta. Of potentially more concern to the baby is the mother with prior treatment for Graves' disease (for example radioactive iodine or surgery) who no longer requires antithyroid drugs. It is very important to tell your doctor if you have been treated for Graves' Disease in the past so proper monitoring can be done to ensure the baby remains healthy during the pregnancy.

3) ANTI-THYROID DRUG THERAPY (ATD). Methimazole (Tapazole) or propylthiouracil (PTU) are the ATDs available in the United States for the treatment of hyperthyroidism (see *Hyperthyroidism brochure*). Both of these drugs cross the placenta and can potentially impair the baby's thyroid function and cause fetal goiter. Historically, PTU has been the drug of choice for treatment of maternal hyperthyroidism, possibly because transplacental passage may be less than with Tapazole. However, recent studies suggest that both drugs are safe to use during pregnancy. It is recommended that the lowest possible dose of ATD be used to control maternal hyperthyroidism to minimize the development of hypothyroidism in the baby or neonate. Neither drug appears to increase the general risk of birth defects.

Overall, the benefits to the baby of treating a mother with hyperthyroidism during pregnancy outweigh the risks if therapy is carefully monitored.

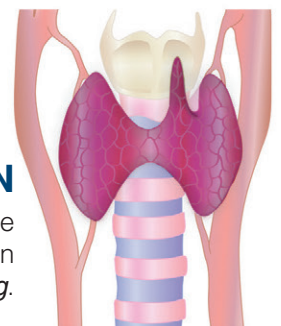
## WHAT ARE THE TREATMENT OPTIONS FOR A PREGNANT WOMAN WITH GRAVES' DISEASE/HYPERTHYROIDISM?

Mild hyperthyroidism (slightly elevated thyroid hormone levels, minimal symptoms) often is monitored closely without therapy as long as both the mother and the baby are doing well. When hyperthyroidism is severe enough to require therapy, anti-thyroid medications are the treatment of choice, with PTU being the historical drug of choice. The goal of therapy is to keep the mother's free T4 and free T3 levels in the high-normal range on the lowest dose of antithyroid medication. Targeting this range of free hormone levels will minimize the risk to the baby of developing hypothyroidism or goiter. Maternal hypothyroidism should be avoided. Therapy should be closely monitored during pregnancy. This is typically done by following thyroid function tests (TSH and thyroid hormone levels) monthly.

In patients who cannot be adequately treated with anti-thyroid medications (i.e. those who develop an allergic reaction to the drugs), surgery is an acceptable alternative. Surgical removal of the thyroid gland is only very rarely recommended in the pregnant woman due to the risks of both surgery and anesthesia to the mother and the baby.

Radioiodine is contraindicated to treat hyperthyroidism during pregnancy since it readily crosses the placenta and is taken up by the baby's thyroid gland. This can cause destruction of the gland and result in permanent hypothyroidism.

Beta-blockers can be used during pregnancy to help treat significant palpitations and tremor due to hyperthyroidism. They should be used sparingly due to reports of impaired fetal growth associated with long-term use of these medications. Typically, these drugs are only required until the hyperthyroidism is controlled with anti-thyroid medications.



## FURTHER INFORMATION

Further details on this and other thyroid-related topics are available in the patient information section on the American Thyroid Association® website at [www.thyroid.org](http://www.thyroid.org).



# Thyroid Disease and Pregnancy

## WHAT IS THE NATURAL HISTORY OF GRAVES' DISEASE AFTER DELIVERY?

Graves' disease typically worsens in the postpartum period, usually in the first 3 months after delivery. Higher doses of anti-thyroid medications are frequently required during this time. At usual, close monitoring of thyroid function tests is necessary.

## CAN THE MOTHER WITH GRAVES' DISEASE, WHO IS BEING TREATED WITH ANTI-THYROID DRUGS, BREASTFEED HER INFANT?

Yes. PTU is the drug of choice because it is highly protein bound. Consequently, lower amounts of PTU cross into breast milk compared to Tapazole. It is important to note that the baby will require periodic assessment of his/her thyroid function to ensure maintenance of normal thyroid status.

**TABLE 1:**

	1ST TRIMESTER	2ND TRIMESTER	3RD TRIMESTER
TSH.....	Normal or Decreased	Normal.....	Normal
Free T4 .....	Normal	Normal.....	Normal
Free T3 .....	Normal	Normal.....	Normal
Total T4 .....	High	High.....	High
Total T3 .....	High	High.....	High
T3 Resin Uptake .....	Low.....	Low	Low
(INVERSE MEASURE OF PROTEIN BINDING)			
Free T4 Index (FT4I, FTI)...	Normal	Normal.....	Normal

## HYPOTHYROIDISM & PREGNANCY

### WHAT ARE THE MOST COMMON CAUSES OF HYPOTHYROIDISM DURING PREGNANCY?

Overall, the most common cause of hypothyroidism is the autoimmune disorder known as Hashimoto's thyroiditis (see *Hypothyroidism brochure*). Hypothyroidism can occur during pregnancy due to the initial presentation of Hashimoto's thyroiditis, inadequate treatment of a woman already known to have hypothyroidism from a variety of causes, or over-treatment of a hyperthyroid woman with anti-thyroid medications. Approximately, 2.5% of women will have a slightly elevated TSH of greater than 6 and 0.4% will have a TSH greater than 10 during pregnancy.

### WHAT ARE THE RISKS OF HYPOTHYROIDISM TO THE MOTHER?

Untreated, or inadequately treated, hypothyroidism has been associated with maternal anemia (low red blood cell count), myopathy (muscle pain, weakness), congestive heart failure, pre-eclampsia, placental abnormalities, low birth weight infants, and postpartum hemorrhage (bleeding). These complications are more likely to occur in women with severe hypothyroidism. Most women with mild hypothyroidism may have no symptoms or attribute symptoms they may have as due to the pregnancy.

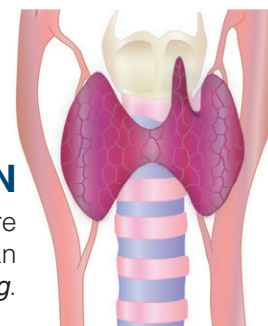
## WHAT ARE THE RISKS OF MATERNAL HYPOTHYROIDISM TO THE BABY?

Thyroid hormone is critical for brain development in the baby. Children born with congenital hypothyroidism (no thyroid function at birth) can have severe cognitive, neurological and developmental abnormalities if the condition is not recognized and treated promptly. These developmental abnormalities can largely be prevented if the disease is recognized and treated immediately after birth. Consequently, all newborn babies in the United States are screened for congenital hypothyroidism so they can be treated with thyroid hormone replacement therapy as soon as possible.

The effect of maternal hypothyroidism on the baby's brain development is not as clear. Untreated severe hypothyroidism in the mother can lead to impaired brain development in the baby. This is mainly seen when the maternal hypothyroidism is due to iodine deficiency, which also affects the baby. However, recent studies have suggested that mild brain developmental abnormalities may be present in children born to women who had mild untreated hypothyroidism during pregnancy. At this time there is no general consensus of opinion regarding screening all women for hypothyroidism during pregnancy. However, some physician groups recommend checking a woman's TSH value either before becoming pregnant (pre-pregnancy counseling) or as soon as pregnancy is confirmed. This is especially true in women at high risk for thyroid disease, such as those with prior treatment for hyperthyroidism, a positive family history of thyroid disease and those with a goiter. Clearly, woman with established hypothyroidism should have a TSH test once pregnancy is confirmed, as thyroid hormone requirements increase during pregnancy, often leading to the need to increase the levothyroxine dose. If the TSH is normal, no further monitoring is typically required. This issue should be discussed further with your health care provider, particularly if you are contemplating pregnancy. Once hypothyroidism has been detected, the woman should be treated with levothyroxine to normalize her TSH and Free T4 values (see *Hypothyroidism brochure*).

## FURTHER INFORMATION

Further details on this and other thyroid-related topics are available in the patient information section on the American Thyroid Association® website at [www.thyroid.org](http://www.thyroid.org).

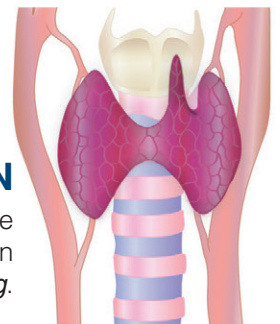




# Thyroid Disease and Pregnancy

## HOW SHOULD A WOMAN WITH HYPOTHYROIDISM BE TREATED DURING PREGNANCY?

The treatment of hypothyroidism in a pregnant woman is the same as for a man or non-pregnant woman, namely, adequate replacement of thyroid hormone in the form of synthetic levothyroxine (see *Hypothyroidism brochure*). It is important to note that levothyroxine requirements frequently increase during pregnancy, often times by 25 to 50 percent. Occasionally, the levothyroxine dose may double. Ideally, hypothyroid women should have their levothyroxine dose optimized prior to becoming pregnant. Women with known hypothyroidism should have their thyroid function tested as soon as pregnancy is detected and their dose adjusted by their physician as needed to maintain a TSH in the normal range. Thyroid function tests should be checked approximately every 6-8 weeks during pregnancy to ensure that the woman has normal thyroid function throughout pregnancy. If a change in levothyroxine dose is required, thyroid tests should be measured 4 weeks later. As soon as delivery of the child occurs, the woman may go back to her usual pre-pregnancy dose of levothyroxine. It is also important to recognize that prenatal vitamins contain iron and calcium that can impair the absorption of thyroid hormone from the gastrointestinal tract. Consequently, levothyroxine and prenatal vitamins should not be taken at the same time and should be separated by at least 2-3 hrs.



## FURTHER INFORMATION

Further details on this and other thyroid-related topics are available in the patient information section on the American Thyroid Association® website at [www.thyroid.org](http://www.thyroid.org).