THE IMPACT OF THYROID DISEASE DURING Pregnancy

ALSO IN THIS ISSUE:

- Hyperthyroidism: When Your Thyroid Gland Goes Into Overdrive
- Practical Tips for Optimizing Continuous Glucose Monitor Use
- The Promise of Stem Cell Regenerative Therapy For Restoring Thyroid Function
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The site features in-depth content about thyroid disease risk factors, symptoms and treatment options, as well as downloadable flyers about the range of thyroid conditions.

Presented by

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This Issue’s Contributors

Hyperthyroidism: When Your Thyroid Gland Goes Into Overdrive

Although less common than hypothyroidism (an underactive thyroid), hyperthyroidism is similar in many ways. Recognizing the symptoms of an overactive thyroid and seeking treatment promptly is important, as the condition can have serious health consequences.

Knowing Your Supplements and Multivitamins Could Save Your Life

Found in many multivitamins, prenatal vitamins and dietary supplements, biotin (vitamin B7) has long been recognized as a substance that can alter the results of thyroid lab tests. Now, the U.S. Food and Drug Administration is warning that high doses of biotin can interfere with hundreds of common lab tests – including some that emergency doctors rely on to diagnose heart attacks.

The Impact of Thyroid Disease During Pregnancy

Healthy thyroid function is essential to the well-being of pregnant women and new moms. It’s also crucial for the health of the baby. But thyroid problems during pregnancy often go undiagnosed. This article examines some of the thyroid illnesses that can impact pregnancy and offers recommendations for testing, treatment and prevention.

Warrior Princess

Being a teenager is tough. Being a teenager navigating the day-to-day demands of a chronic illness is even tougher. That hasn’t stopped a young Michigan girl from sharing her story about thyroid disease in the hopes of enhancing awareness of what she calls an “invisible” illness.

The Promise of Stem Cell Regenerative Therapy for Restoring Thyroid Function

After a century of extraordinary milestones and clinical discoveries, the field of thyroldology has entered a promising new frontier in which regenerative therapy is being used to develop a process for replacing missing or malfunctioning thyroid tissue.

Is Wilson’s Syndrome a Legitimate Thyroid Disease Diagnosis?

Sometimes there’s no easy medical diagnosis to explain non-specific symptoms such as fatigue, weight gain, or insomnia. Although that can be frustrating to hear, be wary of looking for an answer online, particularly when it comes to a so-called condition by the name of Wilson’s syndrome.

Where to Find Reliable Thyroid Disease Information

The World Wide Web has guaranteed that anyone with a computer or smartphone and a connection can find medical information with a few keystrokes. But that doesn’t ensure the information is valid. Here are some resources for up-to-date, relevant and reliable information about the thyroid gland and its various diseases.

Practical Tips for Optimizing Continuous Glucose Monitor Use

Continuous glucose monitors (CGMs) are becoming more and more common as a self-monitoring tool for daily diabetes management. Whether you’re a first-timer or a more seasoned user, these tips will help you maximize performance of your device.

LADA: The “Other” Type of Diabetes

If you’ve been diagnosed with type 2 diabetes but standard treatments aren’t improving your condition, you may have LADA – latent autoimmune diabetes of adults. A complex autoimmune disease, LADA is a form of type 1 diabetes that occurs in adulthood, often with a slower course of onset than type 1 diabetes typically diagnosed in children.

Can Vitamin B Boost My Brain Power?

While studies examining the benefits of B vitamins on cognitive skills aren’t conclusive, there’s plenty of evidence to suggest that taking these essential nutrients can ensure optimal well-being.
EmPower® Magazine, published by the American College of Endocrinology (ACE), the educational and scientific arm of the American Association of Clinical Endocrinologists (AACE), is dedicated to promoting the art and science of clinical endocrinology for the improvement of patient care and public health. Designed as an aid to patients, EmPower® Magazine includes current information and opinions on subjects related to endocrine health. The information in this publication does not dictate an exclusive course of treatment or procedure to be followed and should not be construed as excluding other acceptable methods of practice. Variations taking into account the needs of the individual patient, resources, and limitations unique to the institution or type of practice may be appropriate.

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Hyperthyroidism: When Your Thyroid Gland Goes Into Overdrive

You feel tired. You're having trouble sleeping. Your heart is racing, and you feel shaky day and night. You're under a lot of stress, which might explain these symptoms. Or could it be something else...like a thyroid issue?

Most of us who are knowledgeable about the topic of thyroid disease typically think of hypothyroidism, or low thyroid function, which can cause fatigue, difficulty concentrating and weight gain. However, fatigue and feelings of anxiety can also be symptoms of hyperthyroidism, or too much thyroid hormone. Recognizing these symptoms is important, as nearly all causes of hyperthyroidism require treatment to prevent long-term complications.

Just how much of a problem is hyperthyroidism?

Hyperthyroidism is less common than hypothyroidism, affecting about 1.2 percent of the United States population, compared to 5 percent affected with hypothyroidism. Like most thyroid disease, it is more common in women, and its incidence increases with age.

What symptoms does hyperthyroidism cause?

Thyroid hormone sets the pace for the body’s metabolism, the process by which cells turn nutrients into energy to enable your body tissues to function properly, so having too much thyroid hormone causes symptoms of an overactive metabolism. Persons with hyperthyroidism often experience weight loss despite an increased appetite, feel hot when others are not, have tremors, anxiety and fatigue. You might have difficulty sleeping. Or your bowels can be overactive, leading to frequent bowel movements. The eyes can also be affected with double vision or eye inflammation and pain when the patient has an autoimmune condition called Graves’ disease, which occurs when the immune system launches an attack on the thyroid.

Hyperthyroidism symptoms may be mild in their presentation or can be quite debilitating, particularly in older individuals where unexplained weight loss is often the only symptom. Many people may attribute their symptoms to stress, anxiety or even the normal aging process. However, it’s important to recognize the possibility of thyroid disease, as there are long-term complications arising from untreated hyperthyroidism. Older individuals with hyperthyroidism have a three-fold greater risk of atrial fibrillation, an irregular heart rate that increases the risk of stroke, compared to patients with normal thyroid function. Hyperthyroidism also increases the risk of osteoporosis and fracture. Treatment of hyperthyroidism can help prevent these serious complications.
How does hyperthyroidism develop?

Hyperthyroidism is due to too much thyroid hormone circulating in the blood. Normally, the amount of thyroid hormone in your system is controlled by the pituitary gland, a pea-sized structure located at the base of the brain. The pituitary gland produces a hormone called thyroid stimulating hormone (TSH), which travels through your bloodstream to the thyroid gland where it binds to receptors (a molecule that receives a thyroid hormone and permits it to dock on the nuclear membrane of a cell) and stimulates the thyroid to make thyroid hormone. Normally, when thyroid levels are high, the pituitary gland decreases production of TSH to reduce stimulation of the thyroid and return hormone levels to normal. Similarly, if thyroid hormone levels are low, the pituitary’s output of TSH will increase to stimulate the thyroid gland to produce more hormone (See Figure 1).

In hyperthyroidism, this system goes awry due to a number of causes. The most common cause of hyperthyroidism is Graves’ disease, in which your body produces antibodies that stimulate the TSH receptor on the thyroid gland. The thyroid can’t tell the difference between TSH and the TSH receptor antibodies, so it “thinks” the pituitary is directing the thyroid to make more hormone and the thyroid complies. Patients with Graves’ disease will often have an enlarged thyroid, also called a goiter, due to the increased stimulation of the thyroid gland.

Sometimes patients will have thyroid nodules that are producing thyroid hormone independent of TSH stimulation. This is more common for patients from iodine-deficient geographic areas, but it occurs worldwide.

Inflammation of the thyroid gland can also cause hyperthyroidism. This can occur following a viral infection, after pregnancy, or due to certain medications. In this situation, the inflammation damages the thyroid cells. Normally, the thyroid has large stores of pre-made thyroid hormone waiting to be released. When the cells are damaged, this hormone can leak out and lead to hyperthyroidism. This condition is usually only temporary – once the thyroid heals, the thyroid hormone stops leaking and levels return to normal within several months.

An important cause of hyperthyroidism is medication. Some weight-loss supplements may contain thyroid hormone components and can cause hyperthyroidism. If too little thyroid hormone causes weight gain and fatigue, it seems reasonable to assume too much thyroid hormone would cause weight loss and increased energy. Unfortunately, it doesn’t work that way. Too much thyroid hormone in the body can cause weakness due to loss of muscle mass, fatigue and other significant medical problems. Plus, excessive amounts of thyroid hormone can increase appetite, which is another reason it’s not a good weight-loss tool. It is important to review any supplements you are taking with your physician to ensure you’re taking something that could be causing the problem or making your condition worse.

How is hyperthyroidism diagnosed?

When hyperthyroidism is suspected, a diagnosis is made through a simple blood test to measure both thyroid hormone levels and TSH. In most cases of hyperthyroidism, the TSH will be low as the pituitary is trying to decrease thyroid hormone production in response to the high levels of thyroid hormone in the body. The TSH is the most sensitive test available for measuring thyroid function, and in hyperthyroidism this may be low, even with thyroid hormone levels still in the normal range.

Once the blood test confirms the diagnosis of hyperthyroidism, additional tests may be needed to identify the underlying cause. In Graves’ disease, TSH receptor antibodies can be measured. Imaging studies are also helpful. One test, called a radioactive iodine scan, uses a small, harmless dose of radioactive iodine to help identify where excess thyroid hormone is being produced (thyroid cells are the main cells in the body that can absorb iodine). The thyroid uses iodine in the production of thyroid hormone, so if there is excess hormone production, such as in Graves’ disease, or the result of a hyperfunctioning nodule, a non-cancerous nodule growing in the thyroid that causes it to (Continued on page 6)
produce too many hormones, this area will “light up” on the scan. Conversely, if there is release of hormone stores rather than increased production, as occurs with inflammation of the thyroid, there will be low iodine uptake.

Thyroid ultrasound can also be helpful in identifying nodules. This procedure uses high-frequency sound waves that pass through the skin and are reflected back to the ultrasound machine, creating detailed images of the thyroid. An ultrasound is usually not necessary when the thyroid is overactive unless a nodule is apparent on physical examination and a nuclear medicine scan indicates that it is “cold,” which indicates the nodule is composed of cells that don’t make thyroid hormone. A nodule that is producing too much hormone will show up darker on the scan and is called “hot.”

Review of your medications with your provider is very important to make sure you are not taking excess thyroid hormone or other supplements that could cause hyperthyroidism.

What are my treatment options?
The treatment of hyperthyroidism depends on the underlying cause. If the thyroid is producing too much hormone, which occurs with Graves’ disease or hyperfunctioning nodules, thyroid hormone production can be blocked. There are several ways of doing this. The first is with a class of medications called thionamides. In the U.S., a thionamide called methimazole is commonly used, which blocks a step in the formation of thyroid hormone. The methimazole is typically taken once a day, initially at high doses, but the dose can be decreased as thyroid hormone levels return to normal. Methimazole can sometimes cause a rash, but is usually well tolerated. There are some rare but serious side effects, including liver injury or failure, which occurs in roughly one out of every 10,000 adults taking the medication, and suppression of the immune system, which can lead to potentially life-threatening infections, so your doctor will want to make sure you are aware of symptoms to look for.

Some individuals prefer a more definitive treatment, which can be accomplished with radioactive iodine or surgery. With radioactive iodine, commonly referred to as “thyroid ablation,” the patient is given a higher dose of radioactive iodine than what is used for a diagnostic scan. This will damage the thyroid cells and prevent them from being able to make thyroid hormone. This approach works well for hyperfunctioning nodules, as often only the nodule is damaged and the remaining thyroid gland retains normal function. In Graves’ disease however, since the entire gland is overactive, the patient will often become hypothyroid following treatment and require thyroid hormone replacement medication. Surgery, often reserved for those unable to take methimazole or radiiodine, is another option. If the thyroid gland is removed, there is no other internal source of thyroid hormone, so after surgery, the patient will be hypothyroid and require lifetime thyroid hormone replacement.

Hyperthyroidism due to thyroid inflammation is self-limited, meaning it will get better on its own. No specific treatment for this is needed.

What is the take-home message?
Stress and anxiety are common in modern day society. We often find ourselves having trouble sleeping, which can cause fatigue. However, when this is accompanied by other unexplained symptoms such as palpitations and tremor, or weight loss, the possibility of hyperthyroidism should be considered. While thyroid hormone is essential for normal metabolism, like anything, it is possible to have too much of a good thing.
This past fall, the U.S. Food and Drug Administration (FDA) came out with a warning that high doses of vitamin B7 (also known as biotin) found in dietary supplements can significantly interfere with many commonly ordered lab tests and cause incorrect test results which may go undetected – including tests that emergency room doctors rely on to diagnose a heart attack.

The problem has been reported to have led to at least one death, according to the FDA.

A recent EmPower Magazine article featured information about the interference of biotin on thyroid function testing (www.empoweryourhealth.org/magazine/vol9_issue1/thyroid_patients_be_aware_of_biotin). Still, the interference problem not only continues largely unrecognized, but has become increasingly concerning since it is now evident that biotin can interfere with lab tests beyond those for thyroid function.

Biotin is a water-soluble substance found naturally in liver, eggs, fish (salmon), meat, nuts (peanuts, almonds), seeds and some vegetables. Other high-biotin foods include wheat bran, low-fat cheese and avocados. These foods can provide sufficient biotin to meet your body’s needs and help your body convert food into energy without interfering with lab testing.

Biotin also is found in many multivitamins, prenatal vitamins and dietary supplements. It has been aggressively marketed as a substance that improves hair, nails and skin and has also been touted as a weight-loss agent, with even less scientific support for that notion. A 5- to 10-milligram dose of biotin – an amount that’s commonly added to supplements – is 166 times to 333 times more than the 30 micrograms most individuals need in their daily diets.

Extra biotin causes false high results with some lab tests and falsely low results with others. Most of the published research on biotin interference focuses on hormone test interference, such as parathyroid hormone (PTH), thyroid-stimulating hormone (TSH), and T4 and T3 tests, as too much biotin in lab tests for thyroid hormone levels can lead to a false diagnosis of Graves’ disease, an autoimmune disease that causes too much thyroid hormone (hyperthyroidism) in children and adults. However, biotin in supplements can also affect tests for heart failure, pregnancy, cancer and iron-deficiency anemia.

As an example, there is a blood test to determine levels of troponin, which is a protein that indicates heart muscle damage has occurred. It is commonly ordered in an emergency room to find out if you might be suffering from a heart attack when you report you have chest pain. Unfortunately, troponin can be falsely low when large amounts of biotin are being used by the patient. The FDA has reported that a patient who was taking high levels of biotin died when a troponin test failed to show he was having a heart attack.

It can also interfere with testing for testosterone, estradiol and cortisol hormone levels. Investigators from the University of Minnesota recently reported results from an experiment in which study participants – all healthy adults – were asked to take 10 milligrams of biotin as a dietary supplement for a week. The investigators then tested the participants for nine different hormones, a cancer marker and iron levels, drawing blood before and after the participants took the biotin. The results were surprising even to the investigators: About 40 percent of the tests were thrown off by the supplements.

If you are taking supplements with biotin, it is strongly recommended that you discontinue the supplements one week before you have any planned blood tests OR inform your medical team what supplements or vitamins you are taking.

The FDA is taking steps to advise the general public that biotin is found in many over-the-counter supplements in levels that may interfere with laboratory tests. Examples include:

- B-complex vitamins
- Coenzyme R
- Dietary supplements for hair, skin, or nail growth
- Multivitamins
- Prenatal vitamins
- Vitamin B7 supplements
- Vitamin H

There are many more, so check your vitamins very carefully for biotin levels and advise your healthcare team accordingly.
Thyroid disease is relatively common in pregnant women. Hypothyroidism (too little thyroid hormone) occurs in at least 2 to 3 percent of pregnant women, while hyperthyroidism (too much thyroid hormone) occurs in up to 1 percent of all pregnancies.

Recently a national guideline was produced by the American Thyroid Association (ATA) that provided recommendations for the treatment of thyroid disease during pregnancy (www.thyroid.org/association-guidelines-management). Below we highlight some of the thyroid illnesses that can impact pregnancy and the recommendations for testing, treatment and prevention of these conditions.

**Hypothyroidism and Pregnancy**

Common symptoms of hypothyroidism include fatigue, weight gain, cold intolerance and constipation. Thyroid hormone from the mother is needed for growth and development of the unborn baby. During pregnancy, the amount of thyroid hormone required for both the mother and the developing baby increases by 40 percent, on average. So for women who have thyroid disease that has affected the ability to make enough thyroid hormone, or those who have had their thyroid destroyed by radioactive iodine or surgically removed, the gland no longer has the ability to increase thyroid hormone production as needed.

Therefore, it is very important that any woman with a history of hypothyroidism notify their physician or endocrinologist as soon as they know they are pregnant. Prompt testing of the woman’s thyroid hormone levels is extremely important, as it is very likely that the dosage of thyroid hormone medication will need to be adjusted. Additionally, testing blood levels at intervals throughout the pregnancy is crucial to make sure that normal thyroid hormone values are maintained throughout the pregnancy. Typically, testing thyroid function every four weeks through the first half of the pregnancy is recommended, with a general goal of maintaining a TSH (thyroid stimulating hormone) blood level less than 2.5mIU/L when on thyroid hormone replacement medication. Thyroid-stimulating hormone is made by the pituitary gland in the brain and directs the thyroid to make and release thyroid hormone into the blood. TSH levels that are too high or too low can indicate your thyroid isn't working correctly.

A separate but important issue during pregnancy is the presence of an antibody called thyroid peroxidase antibody (TPO Ab). This antibody is very common in patients with Hashimoto’s disease, which is the most common cause of hypothyroidism (low thyroid function) and is present when the body’s immune system – normally designed to detect and attack things like bacteria that don’t belong in the body – mistakenly sees the thyroid as something “foreign” and makes antibodies that attack the thyroid tissue.

It is recommended that patients with hypothyroidism who are pregnant be tested not only for their thyroid function (serum TSH), but also for the presence of this TPO antibody. This is because the presence of the TPO antibody appears to increase
the risk of miscarriage and other pregnancy complications. There is some clinical data that suggest that thyroid hormone replacement medication may reduce these pregnancy risks and that if the antibody is present, it is even more important to keep within the TSH range of less than 2.5mIU/L. This is a complex issue and should be thoroughly discussed with your physician.

The most important aspect of caring for pregnant women with hypothyroidism is to ensure they are aware of the importance of notifying their physician if they are planning pregnancy or suspect themselves newly pregnant. Frequent thyroid hormone checks throughout pregnancy, and appropriate adjustments to thyroid medication as is typically needed, can lead to a safe and successful pregnancy.

Hyperthyroidism and Pregnancy

Common symptoms of hyperthyroidism, such as fatigue, palpitations, anxiety and heat intolerance, can overlap with the symptoms of a normal pregnancy. In the first trimester, high levels of normal pregnancy hormones sometimes cause mildly high levels of thyroid hormone. This usually occurs in women with more severe nausea and vomiting (morning sickness). This form of pregnancy-induced hyperthyroidism usually improves after the first trimester as pregnancy hormone levels drop and does not need any treatment.

Graves’ disease is the most common type of hyperthyroidism in young women. In Graves’ disease, the immune system fails to recognize the thyroid gland as “self” and makes antibodies that attach to the thyroid gland and cause it to become overactive. Untreated hyperthyroidism from Graves’ disease can be dangerous both for a pregnant woman and her unborn child.

Both of the medicines used to treat Graves’ disease (methimazole and propylthiouracil, or PTU) can cause birth defects, although PTU is the safer of the two in the first trimester of pregnancy. Women with Graves’ disease who are planning a pregnancy should discuss the best treatment options with their doctor. One option is removing the thyroid with surgery or treating it with radioactive iodine treatment before conception so that Graves’ disease medicine is not needed in pregnancy. Another option is to continue medicine (usually PTU) during pregnancy, but to use the lowest possible dose. In some cases, patients with mild disease may be able to stop their medicine as soon as pregnancy is diagnosed. It is important to do this only after discussion with a physician and only when very close monitoring can be performed.

The Importance of Screening

Screening for the presence of thyroid disease in patients who are newly pregnant has been an active area of research and interest for many years, since thyroid disease is very common. Furthermore, as noted above, thyroid disease can adversely impact pregnancy as well as the health of the developing baby. So it might seem logical to recommend screening every pregnant woman for thyroid disease.

In the last few years, two large studies investigated the utility of such a screening recommendation. Surprisingly, the studies showed no benefit to early screening. Specifically, the ability to detect, intervene and normalize thyroid function in pregnant women with mild hypothyroidism did not demonstrate an improved outcome in the IQ of the child, which was the focus of earlier studies theorizing that babies born to mothers with undiagnosed or inadequately treated hypothyroidism are at risk for lower IQ scores and learning disabilities.

Because of this, and even though some in medical circles question whether thyroid hormone treatment was started early enough in pregnancy in these studies to have had an impact, current guideline recommendations do not support universal screening of all newly pregnant women for thyroid disease. However, the guidelines did support physicians asking all women who are planning pregnancy or are newly pregnant if they have a history of thyroid disease or risk factors for thyroid disease. If risk factors are present, then thyroid testing is recommended.

Risk factors include age greater than 35 years old, symptoms which could be related to thyroid dysfunction, symptoms which could be related to thyroid hormone excess/insufficiency, a family history of thyroid problems, and obesity among others. A full list of such risk factors can be found in the ATA guidelines document.

Iodine

Iodine is a nutrient that is needed to make thyroid hormone. Pregnant women need more iodine in their diets than non-pregnant women to maintain normal thyroid function. Even mild iodine deficiency in pregnant women has been linked to lower intelligence in their children. Globally, salt iodization (fortifying edible salt with iodine) has been the leading strategy for eliminating iodine deficiency. In the U.S., salt iodization has never been mandated by law, and most of the salt we eat is not iodized. While the population as a whole has been iodine sufficient since the 1940s, mild iodine deficiency has recently been identified in pregnant U.S. women.

Although blood and urine testing can identify populations at risk for iodine deficiency, there is currently no laboratory test that can determine the iodine status of an individual. Thus, it is recommended that all U.S. women who are pregnant, breastfeeding, or planning a pregnancy take a prenatal multivitamin that includes 150 µg (micrograms) of iodine daily.
By Mary Green, AACE Staff

To the casual observer, Jolee Wolf may appear to be a typical teenager.

An 8th grader at Carrolltown Middle School in Saginaw, Michigan, the 14-year-old likes junk food (pizza and candy bars are favorites), pop punk band Fall Out Boy, and Netflix sci-fi/horror series “Stranger Things.”

But appearances can be deceiving.

Jolee has waged an uphill health battle that began at birth and continued unabated until she was diagnosed with thyroid disease.

Born underweight, Jolee was a sickly child with myriad health issues, says mom Beth. “Jolee was almost 5 years old before she could speak her first words, and this was only after three years of speech therapy,” she notes. “Also, she wasn’t growing. In roughly 10 years’ time, she only averaged maybe two inches of growth a year. She was so tiny, we were afraid of a stiff wind.”

Jolee also suffered from gastroesophageal reflux disease (GERD), a chronic digestive disease that occurs when the muscle at the bottom end of the esophagus doesn’t close properly, allowing stomach acid to leak back, or reflux, into the esophagus, causing irritation and tissue damage over
time. Because she couldn’t digest any processed foods, she was required to follow a specialized diet to minimize flare-ups. She also had swallowing and breathing issues. And her poor vision required trifocal glasses.

The turning point in Jolee’s medical journey occurred at age 9 when her mother noticed a significant swelling in her daughter’s neck shortly after a routine endoscopy for the GERD. “I didn’t know if the scope irritated it or if it had something to do with her having a bad reaction to the anesthesia used in the procedure, but it really jumped out quickly,” Beth recalls. “There was a little bump that got bigger really quick, but I wasn’t having any problems, so I thought it might be normal,” adds Jolee.

Following blood tests, Jolee’s pediatrician diagnosed the tennis ball-sized lump as goiter, a swelling of the neck resulting from enlargement of the thyroid gland. “As soon as the test results came back, they rushed us to the University of Michigan (U of M) Children’s Hospital within that work week,” Beth says. “Her thyroid hormone levels were so far off the charts the nurses were calling me two to three times a day.”

U of M physicians diagnosed Jolee with hypothyroidism, a condition in which the thyroid, a butterfly-shaped gland located in the front of the neck just below the neck, doesn’t produce enough hormones. These hormones regulate a number and variety of vital body functions, including breathing, heart rate, body weight, muscle strength, body temperature, cholesterol levels and many more. Hypothyroidism can be present at birth, a condition called congenital hypothyroidism, or can develop later in childhood. Hypothyroidism is particularly problematic in children as it is essential for normal growth and brain development.

Jolee was prescribed levothyroxine, a synthetic form of thyroid hormone, to compensate for her underactive thyroid.

Pediatric endocrinologist Dr. Muhammad Jabbar subsequently took over Jolee’s care at a location closer to home and, after further testing, identified her condition as Hashimoto’s thyroiditis, the most common cause of hypothyroidism in children and adolescents. In Hashimoto’s thyroiditis, the body’s immune system — which normally protects the body from invading infections — mistakenly senses the thyroid gland cells as foreign and attacks them, leading to inflammation of the thyroid. Over time, this damages the thyroid gland, impairing its ability to produce hormones. While the disease is most common in adult females, it can occur in both genders and at any age.

For a period of time, Jolee’s thyroid hormone levels were checked every 6 months and medication adjustments were made as needed. Once her hormone levels were stabilized, “I was happier, I wasn’t so fatigued, I wanted to do more, I was in a good mindset at all times, and life was easier than it was before,” Jolee says.

“Let me tell you, her whole world has changed since she’s been seen by Dr. Jabbar,” Beth adds. “He’s the one that got her thyroid levels on target and has kept them adjusted. And the improvements we’ve seen in these last couple of years are amazing. Jolee has become a ‘normal’ person, per se.”

Still, a very specific challenge remained.

“The only people who really knew about my medical problem were my closest friends and my teachers, so I was bullied for the longest time

(Continued on page 12)
about having food in class and having special exceptions at school that other kids didn’t,” Jolee says. “I wanted to finally tell people, ‘I have a problem,’ and spread awareness of my disease.”

She recently went public with her diagnosis after receiving a literature class assignment directing students to research and prepare a presentation for their classmates on any topic they wanted to address. Jolle chose to talk about thyroid disease. The reception she received far exceeded her expectations.

“At first, I was a little nervous and I was thinking to myself, ‘Are they going to tease me even more?’ But after my talk it was like people actually understood,” Jolee says. “I tried to put it into terms that everyone could understand, and if they had any questions about any of the big words, they could ask me after my presentation.”

“Most of them said, ‘I didn’t know you had this, you seemed so normal,’ and it made me feel amazing,” she continues. “I mean, people finally understood that I have an invisible illness, and they just didn’t know anything about it, so I helped their understanding. And there’s more acceptance in my life for who I am and what I do.”

These days, Jolie is thriving. She’s no longer tiny, standing tall at 5’ 7” after a growth spurt of 10 inches in the last few years. She no longer wears tri-focals. She excels in her favorite class, honors English Language Arts. She’s holding close to a 4.0 grade average. And she’s a proud member of the Carrolltown Cross-Country team.

In hindsight, her mother believes thyroid dysfunction may have been at the heart of Jolee’s many medical issues. “They identified a lot of problems with her when she was younger, but the more research I do and the more I think about it, a lot of it is falling back to or is tied into the thyroid, is what it seems to be,” Beth notes. “And we’re finding the more we keep that thyroid on track, the better she functions, in every way: mentally, emotionally, physically.”

Still, she is quick to credit not only the ongoing medical care her daughter has received for the turnaround, but also her daughter’s can-do spirit.
“Jolee may have grown up with this, but we’ve had to do a lot of adjusting of her medications because of the fact that she’s a growing child, her body is still developing, and she also went through puberty, too, which isn’t fun for even normal kids,” she notes. “And, understandably, it’s been hard on her. She has all these sicknesses that go with thyroid disease, but she has a strong will about her.

“She’s put up with more in her short 14 years of life than most people have to in a lifetime,” Beth adds. “She’s probably the bravest person I know, to be honest. She’s the toughest, bravest person I know.”

Adds Jolee, “Some days I have such a hard time that I don’t feel like doing anything, but then the next day I bounce back and know I need to do whatever I need to do to keep things on track on a daily basis.

“I guess I would say it’s not just an illness, it’s something you have to live with. It’s like a forever roommate...but that doesn’t mean that life has to suck. It only sucks if you make it that way. Life can be beautiful, so you have to make it beautiful and make the best of it.”

Spoken like a true teenager...and a warrior princess.
he clinical features of a severely underactive thyroid (hypothyroidism), known in medical circles as “myxedema,” were first recognized in the 1600s. However, not until 1883, when Swiss physician and surgeon Dr. Theodor Kocher observed myxedema after thyroidectomy (surgical removal of the thyroid), was the link to a properly functioning thyroid gland and its importance established, a discovery that later earned Dr. Kocher the 1909 Nobel Prize in Medicine.

The emergence of modern endocrinology followed in 1891 when British physician Dr. George Redmayne Murray introduced the successful treatment of a myxedema patient with injected extracts of sheep thyroid gland, one of the first examples of hormone replacement therapy. Just one year later, the treatment was made even easier for patients by simply eating, instead of injecting, ground or fried sheep thyroid or tablets of dried thyroid tissue.

More discoveries followed. The thyroid hormone thyroxine (T4) was discovered in 1914. In 1920, the role of iodine in the treatment of goiter (thyroid enlargement) and in cases of severe deficiency to treat an underactive thyroid was established, underscoring the need for dietary iodine supplementation. The structure of T4 was identified and synthesized in 1926. A second and more potent thyroid hormone, triiodothyronine (T3), was discovered and synthesized in 1952. Methods for measuring thyroid stimulating hormone (TSH), the key test for checking whether the thyroid is working properly or the proper amount of thyroid hormone is being taken in by the body, were developed in the 1960s. In 1970, physicians learned that most T3 was produced by the conversion of T4 into T3 outside of the thyroid. This served as the scientific basis for treating hypothyroidism with T4 alone, the mainstay of treatment to this day.

By the mid-1970s congenital hypothyroidism screening programs were implemented, virtually eliminating congenital hypothyroidism in developed portions of the world. Since then, more sophisticated laboratory tests called serum assays have enabled us to diagnosis mild or early hypothyroidism, termed “subclinical hypothyroidism.” Plus, reliable thyroid hormone preparations have enabled physicians to precisely and safely treat hypothyroidism, whatever its degree.

After a century of clinical milestones and triumphs in thyroidology, the field of studying the thyroid and treating those with thyroid conditions, the identification and treatment of hypothyroidism has come a long way. As disease states go, the progression is nothing short of remarkable.

Thanks to advances in science, we are now entering a new phase of exciting major discoveries and breakthroughs that...
offer the promise of further revolutionizing the treatment of hypothyroidism for many patients.

Our laboratory is pursuing this goal, using regenerative therapy techniques to develop a process for replacing missing or malfunctioning thyroid tissue. This article will explain what regenerative therapy is, discuss some of the progress we have made to date, and how our discoveries could help patients with hypothyroidism.

What is regenerative medicine and therapy?
Regenerative medicine is a research field which deals with the "process of replacing, engineering or regenerating human cells, tissues or organs to restore or establish normal function." Its focus is to either have the body repair damaged tissues and organs on its own or to grow tissues and organs from the patient’s tissues or organs in the laboratory, then implant them in the body they were taken from. Regeneration could, in some instances, take the place of transplantation, eliminating the obstacles of getting a matching donor and being on powerful medications to prevent organ transplant rejection. For those with hypothyroidism, thyroid gland regeneration would eliminate the need to take lifelong thyroid hormone.

Can’t the thyroid gland regenerate itself just like the liver does?
A normal liver is uniquely able to regenerate itself and to produce the right amount of tissue to make up for what is lost, for example, after donating some tissue for a transplant recipient. Although the thyroid can sometimes make up for loss of function following partial surgical removal, or recover from inflammation, it requires enough remaining normal thyroid tissue to do so. Those with congenital hypothyroidism (born with an absent or underactive thyroid), whose thyroid glands have been surgically removed, or have an underactive thyroid due to chronic inflammation (Hashimoto’s thyroiditis), the most common cause of hypothyroidism in North America, there isn’t enough normal tissue to restore normal function.

What are the key factors for regenerating the thyroid gland?

Stem cells are the key to regenerating tissues. They are immature cells that still have the ability to develop into many different cell types in the body.

There are several types, or classes, of stem cells. Some that are taken from adults fall into the category of “multipotent” (as in multiple or many) stem cells. Others such as embryonic stem cells (ESC), which fall into the category of “pluripotent” stem cells, can give rise to any type of cell in the body. The development of a type of pluripotent cell known as induced pluripotent cell (iPSC), through reprogramming of adult cells, has been a major breakthrough, because any individual rather than embryos only could be used as a source.

What has been accomplished thus far?
Advances in embryonic stem cell (ESC) and induced pluripotent stem cell (iPSC) technology have improved our understanding of follicular cell development and have opened up the possibility of regenerative therapy for hypothyroidism. Follicular cells are the thyroid cells that make thyroid hormone (T4 and T3). Through a series of recent scientific advances made in our laboratories and elsewhere, we have been able to produce follicular cells from the ESC of mice that not only had the ability to grow but, most importantly, were also able to start making thyroid hormone within two weeks and produce normal amounts of thyroid hormone eight weeks after they were transplanted into mice that did not have thyroid glands. Furthermore, the transplanted cells grew normally without any signs of tumor formation.

What remains to be done?
While we are encouraged by what we have accomplished to date in mice and have shown that human iPSCs can be made to function in many key ways like normal human thyroid follicular cells, we need to show that what we have done with mice can be done with human cells. Given the progress in the field to date, we believe that this is possible and transplantable follicles (units made up of thyroid follicular cells) will be produced in the not-too-distant future. Reaching this milestone will enable us to determine whether the approach we developed could be used to repair hypothyroidism in our patients.

To read more about thyroid stem cell regenerative therapy, visit the following:

www.bu.edu/research/articles/stem-cells-to-thyroid-cells
www.sciencedaily.com/releases/2015/10/151022124516.htm

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Is Wilson’s Syndrome a Legitimate Thyroid Disease Diagnosis?

By Catherine J. Tang, MD

It’s not uncommon for a patient to visit a doctor complaining of nonspecific symptoms that can make a conclusive diagnosis challenging. Such is the case with a little-known and often-controversial diagnosis call “Wilson’s Syndrome” or “Wilson’s Temperature Syndrome.”

Wilson’s Syndrome was first identified and defined in 1990 by family physician Dr. E. Denis Wilson to describe a constellation of common symptoms including, but not limited to, fatigue, chilliness, constipation, weight gain, dry skin, swelling, joint pains, hair loss, brittle nails, insomnia, depression and anxiety. Dr. Wilson developed the concept after observing people with symptoms of an underactive thyroid (as described above) and low body temperature (consistently averaging below 98.2°F), yet whose blood tests showed normal thyroid levels.

Dr. Wilson theorized that these common symptoms often found in hypothyroidism are due to low levels of T3, which is a form of thyroid hormone in the body. The thyroid gland, located in the neck, produces two thyroid hormones, T3 and T4. However, most T3 is made outside the thyroid gland since the body changes T4 into the more active T3 once it is released into the bloodstream and has reached its target in the body. This T3 has an effect on almost every organ system and is needed to regulate the body’s metabolism and energy expenditure.

Dr. Wilson suggested that under severe stress, the body converts less T4 to T3 (which may not be picked up by blood tests) and hypothesized that this slows down the metabolism and lowers the body temperature, which manifests as various symptoms as mentioned above. As such, he started treating his patients with thyroid hormones, both T3 and T4, despite their normal blood tests, and claimed the symptoms resolved upon treatment. On his website, Dr. Wilson describes several patient cases who benefited from this treatment strategy, including that of his wife. Further, Dr. Wilson advocates treatment with herbal supplements and has co-founded an herbal supplement company with a naturopathic practitioner to provide these herbs.

Could I have Wilson’s Syndrome?

In short, the answer is no. Wilson’s Syndrome is not an evidence-based diagnosis and is not accepted by the medical community, including almost all practicing and board-certified physicians, including endocrinologists who specialize in identifying and treating hormone disorders. While it is true that lower T3 levels have been associated with acute or chronic illnesses, including psychiatric disorders, neither clinical nor laboratory research have shown that T3 therapy can improve or restore wellness. In fact, the body’s conversion of T4 to T3 is tightly regulated by the target organs, and giving excessive T3 may actually cause harm, including heart palpitations, anxiety, heart failure and even death.

Still, these symptoms are real and can cause significant suffering and functional disability in some people. And while many of these symptoms also overlap with those of hypothyroidism, they are also commonly found in the general population. In fact, it is likely that nearly all of us have experienced these symptoms at some points in our lives. Some may indeed have true hypothyroidism, but most will respond well to thyroid hormone treatment. T4 is the preferred therapy in hypothyroidism as it mimics the body’s natural way of providing thyroid hormone to the cells.
Why is Wilson's Syndrome so misleading?

Giving a name to a compilation of generic, nonspecific and unrelated symptoms does not make it a true medical diagnosis. As mentioned previously, most of us have experienced some of these symptoms at various times in our lives. It does not necessarily mean that we have a disease. Rather, there are often other factors that can contribute to these symptoms, including concurrent chronic illnesses such as heart disease and diabetes; psychiatric conditions such as depression and anxiety; and life circumstances such as family illnesses, divorce, financial troubles, or high levels of stress.

A key component of a Wilson's syndrome diagnosis is a low body temperature, a symptom that Dr. Wilson proposed treating with T3 (either prescription or herbal) to restore one’s normal body temperature. This concept is misleading, as it suggests that we should all have one body temperature – 98.6°F – all the time. However, studies have shown that our body temperatures actually fluctuate throughout the day and, in younger women, also depends on the timing of their menstrual cycle.

Moreover, T3 treatment for Wilson’s Syndrome is not based on scientific evidence, since it hasn’t been submitted to rigorous clinical or laboratory research. Generally, the best way to discern if a treatment is effective is to conduct an unbiased study, in which neither the researchers nor the participants know who is taking the drug being tested and who is taking a placebo (e.g., sugar pill). Frequently, the proposed therapy is also compared with conventional treatment to see if one is superior or if both treatments are equivalent. However, Dr. Wilson’s experience of using T3 to treat a variety of nonspecific symptoms is entirely anecdotal and subjective. Because no clinical trial was conducted, we don’t know if his results are reproducible, nor do we know the success or failure rates of his therapy and its potential side effects. In addition, he advocates using herbal supplements, which are not FDA regulated and their ingredients cannot be verified.

Furthermore, Wilson’s Syndrome has a similar name to and, thus, can be confused with a real and potentially life-threatening medical disorder called Wilson’s disease. Wilson’s disease is a rare, inherited disorder that causes copper to accumulate in the liver, brain and other vital organs.

What can I do if I have these symptoms?

You should discuss your symptoms with your primary care physician (PCP) to make sure that your other medical problems are appropriately managed, as well as being up-to-date with preventative care such as age-appropriate cancer screening, cholesterol screening and immunizations. If your PCP feels that a referral to an endocrinologist is indicated, then you may undergo some blood tests to see if you have a hormonal problem.

Here are some other things to consider: If you are overweight, ask your doctor if you can enroll in a dedicated weight-loss program, or you can do it on your own by cutting out junk food and doing at least 30 minutes of moderate-intensity aerobic exercise four days a week. If you have diabetes, make sure that your blood sugar is well controlled. If you snore, ask your PCP if you should undergo testing for sleep apnea. If you have anxiety or depression, make sure that you stay connected with your mental health professional and your medications are appropriately adjusted. If you recently had stressful personal circumstances, see if you can obtain support from family, friends, or a mental health professional. Some patients have found alternative approaches helpful, including cognitive behavioral therapy, exercise, acupuncture and tai chi, a form of mind-body practice exercise that originated in China as a martial art and has value in treating or preventing many health issues.

A healthy, well-balanced diet and regular exercise are beneficial for everyone. In fact, there are studies that have shown that they can improve many health parameters, including lowering the cholesterol, reducing anxiety and depression, and improving one’s quality of life. Try to limit your intake of saturated fats, trans fats, and simple sugars which are found in many processed food and snacks, cheese, candy, soda, chips and pretzels and frozen “TV” dinners. Instead, make a goal to cook your meals at home and get most of your nutrition from vegetables, fruits, whole grains and lean protein.

In addition, try to add more physical activity in your life – walking just 30 minutes a day is beneficial. Other simple strategies to increase your daily exercise include parking your car farther from your destination and walking the distance or taking the stairs rather than the elevator. Every little activity counts and it might make the difference between feeling well and unwell.

And remember — although it’s understandably frustrating to have persistent symptoms your physician can’t readily explain, it’s much worse to accept an unrecognized diagnosis such as Wilson’s Syndrome. Unproven therapies for so-called Wilson’s Syndrome may leave you feeling sicker, while a treatable condition can go undiagnosed.
Admit it. You’ve done it. You suspect you have a thyroid problem or have recently been diagnosed with thyroid disease, so you grab your laptop, fire it up, and begin a deep dive into the hundreds upon hundreds of sites that claim to offer the latest and most relevant information about the thyroid.

While being an active and engaged patient is important, filtering through the vast amount of content available on the internet to find reliable information can be a daunting task.

Not to worry—here is a listing of several reputable resources that you can have confidence in:

**Thyroidawareness.com**

Twice selected by popular health information website Healthline™ for a “Best Blogs” award, thyroidawareness.com features comprehensive content created and curated by American Association of Clinical Endocrinologists (www.aace.com) members who are thyroidologists, experts in the diagnosis and treatment of a wide array of thyroid diseases.

The website offers an easy-to-understand overview of the thyroid gland and how it functions, as well as comprehensive information about common thyroid disorders and their treatment, from hypothyroidism and thyroid nodules to thyroid cancer and thyroid disease in pregnancy. downloadable educational PDFs about various thyroid conditions are also featured on the site: thyroidawareness.com/educational-resources.

A companion site created by AACE physicians, empoweryourhealth.org, contains a number of in-depth articles to expand your knowledge about thyroid disease.

**Endocriniediseases.org**

This patient education site is sponsored by the American Association of Endocrine Surgeons (AAES), whose members are committed to providing surgical expertise in diseases of the thyroid, parathyroid, adrenal glands and neuroendocrine tumors. In addition to providing background information in diseases of thyroid function, the site includes detailed information regarding pre-operative testing, main types of thyroid surgery, what to expect during the recovery process and circumstances in which observation of the patient is elected in lieu of surgery. Patients can also access the AAES Surgeon Finder tool to search for high-volume thyroid/endocrine surgeons located around the country.

**GDATF.org**

Established in 1990 as the National Graves’ Disease Foundation, the Graves’ Disease & Thyroid Foundation provides online (and offline) education and support for Graves’ disease patients, their families, friends and healthcare professionals. Its website includes a list of support groups around the country, frequently asked questions about Graves’ disease and other thyroid-related illnesses and more.

**Hormone.org**

Included in the Hormone Health Network site, sponsored by international medical association the Endocrine Society, are descriptions of common thyroid conditions and downloadable handouts in English and Spanish. The site is designed to help patients and their physicians have more informed discussions about hormones and health.

**Thyca.org**

Thyca.org is the website of ThyCa (the Thyroid Cancer Survivor’s Association), an all-volunteer, nonprofit organization of thyroid cancer survivors, family members and health care professionals. The group maintains current information about thyroid cancer and offers support services available to patients at any stage of testing, treatment, or lifelong monitoring for thyroid cancer. The site also serves as a resource for anyone interested in thyroid cancer survivors’ issues.

Keep in mind that the information provided by these sources is for educational purposes only and is not a substitute for proper medical care. If you suspect you have a thyroid issue, your best course of action is to see a specialist in thyroid diseases. To start your search for a physician in your area, visit the American Association of Clinical Endocrinologists’ “Find an Endocrinologist” page at: www.aace.com/resources/find-an-endocrinologist.
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As their accuracy increases and their ease of use is enhanced, continuous glucose monitors (CGMs) are becoming more common as a glucose self-monitoring tool for daily diabetes management.

Composed of a sensor inserted under the skin, the FDA-approved device constantly "reads" your blood glucose levels and transmits the information to a receiver where the levels are displayed, giving the user a window into the patterns of blood glucose highs and lows after eating different foods, engaging in physical activity and administering insulin.

There are now three types of sensors available in the United States. These sensors include: Medtronic Enlite/Guardian, Dexcom and Abbott Freestyle Libre. There are many similarities and some significant difference between these sensors (refer to reference chart on page 22 for details).

While the device provides users valuable information to help with their diabetes management, it’s important to understand how to optimize the performance of a CGM. Whether you are a savvy CGM user or considering CGM therapy for the first time, here are some common questions that patients frequently have about the proper use of CGMs.

**How does the sensor work?**

The sensor is inserted with a removable needle into subcutaneous (under the skin) tissue about 5 to 8 millimeters beneath the skin's surface, where it measures interstitial glucose (blood sugar). Interstitial fluid is the fluid that surrounds the cells of your tissue below your skin.

**Why is there a difference in sensor glucose versus blood glucose?**

Glucose is first absorbed in the intestines and transported to the blood. Blood then carries glucose to to every cell in the body, including the interstitial tissue where the sensor is measuring glucose levels. Changes in glucose are first observed in the blood with a fingerstick and then observed at the interstitial tissue. There may or may not be a difference in sensor glucose and blood glucose measurements. It’s more common to observe a difference when glucose is rapidly changing, right after eating or during/after exercise, for
example. However, sensor glucose trends should represent the change in glucose accurately, even if the blood glucose and sensor glucose do not match up perfectly at a given time.

**What if I’m not getting accurate sensor data?**

It can be a frustrating experience when sensor data and fingerstick blood glucose data aren’t consistent. There are a couple of steps to consider when this is a problem: stay hydrated or try wearing the CGM in a different site – either in the abdomen, upper thigh, arm or even just above the calf. Again, it is more likely that the sensor will not match the fingerstick blood glucose if glucose is rapidly changing.

**The sensor will not stay on for the full seven or 10 days of wear. What can I do?**

The tape that comes with the sensors is meant to last for seven to 10 days of wear, depending on the type of sensor you use. Skin types and activity level can affect how well the sensors remain adhered to the skin. Applying the sensor after a shower when the skin is totally clean and has minimal oil may help it adhere better. Also, make sure your skin is completely dry before applying the sensor. There are other tape options that can help reinforce the sensor. Some common products include: GrifGrips, Hypafix® and Skin Tac™. Skin Tac is like glue and can be applied to the sensor tape; then apply the sensor to the skin, as usual. Grif Grips and Hypafix are two of many excellent tape reinforcement options.

**Can I reinsert my sensor if it falls off?**

If part of the sensor that is inserted under the skin comes fully out, it can’t be reinserted. If the tape become loose or the sensor partially comes out, you can try to gently push the sensor back underneath the skin. It’s possible this will not work depending on how long the sensor has been hanging out of the subcutaneous tissue. It’s important to reinsert the sensor immediately if you notice it has partially come out. In this circumstance, make sure to initially monitor blood glucose more frequently with finger sticks in case the sensor was damaged and is unable to collect accurate data. If the data is not accurate, make sure to remove the sensor and insert a new sensor. Contact your sensor company to let them know there was a problem so the sensor can be replaced. Usually they will do this at no cost if you call within a reasonable time of when the problem/error occurred.

**What do I do with the sensor when I shower?**

Leave the sensor on. It’s important to make sure the sensor is well adhered to the skin prior to showering to prevent moisture from getting under the adhesive, which can cause it to loosen or become itchy. Avoid taking the receiver device in the shower unless the receiver is a waterproof pump. It’s best to leave the pumps or receivers in a safe space within 20 feet of the shower to avoid losing data connection.

**Can I go swimming with my sensor?**

Yes! All sensors are waterproof. The sensor may lose connection from the receiver device for a period of time depending on how long you spend in the water. The shorter the distance you are from the receiver and the shorter the duration in the water, the less likely your sensor data will be disconnected. If sensor data becomes disconnected from the receiver, usually once the sensor is back in range, it can reconnect automatically without a problem. If this doesn’t happen, make sure to call your sensor company to assist you with troubleshooting or send a new sensor, if needed.

**What do I do when I need to go through airport security?**

Most airports now have full-body scanners. Make sure to have TSA give you a pat-down if you’re wearing a sensor. Some of the sensors can go through the x-ray machine. Check with the device manufacturer. *(Refer to article on page 22.)*

**What do I need to do when I have an MRI, CAT scan or X-ray?**

The sensor needs to be removed for a CT or MRI scan. If the area of the body undergoing an X-ray is located where the sensor is worn, it needs to be removed. If the sensor can be protected from X-rays with a lead covering, it can be worn during the procedure.

**Can I wear the sensor during other medical procedures?**

Discuss this with the medical team performing the procedure. If this is a procedure that requires anesthesia (being put to sleep for a period of time), you should not need to take the sensor off so you can resume using sensor data after the procedure. Ask your medical team members if they want to be alerted to the continuous glucose data during the procedure. Make sure they are aware of the location of the sensor on your body so they can avoid dislodging it. During procedures in which you will be awake, such as mole removal, root canals, and so forth, make sure the team knows you have a device that has an alarm.

**If I have a headache, can I take acetaminophen (Tylenol®)?**

Most drugs do not interact with the sensor data. Unfortunately, Tylenol may cause a false sensor glucose “high” with the Dexcom receiver. If Tylenol needs to be used while wearing the Dexcom, close the receiver app on the phone and disregard sensor data for eight to 10 hours until the Tylenol has cleared out of your system.

**If my back hurts, can I take aspirin?**

Aspirin does not interact with any sensor data.
Practical Tips for Optimizing Continuous Glucose Monitor Use
(Continued from page 21)

Can I use a sensor if it is 30 days post expiration date? Ninety days post expiration date?

Technically the sensors should not be worn after the expiration date. This is because the data may not be accurate. It won't hurt your body, it just may not be helpful. Given how expensive sensors can be, it is understandable that you may want to wear it beyond the expiration date. If you choose to wear a sensor beyond the expiration date, be aware that the data may not be accurate. In this circumstance, it’s very important that treatment decisions be made based off fingersticks, not just sensor data alone. If the data turns out to be consistently and significantly inaccurate, the sensor should be removed.

I don’t want to do fingersticks. Can a sensor replace them?

The Libre is the only factory-calibrated sensor that doesn’t require additional fingersticks for calibrations or treatment decisions. Some people experience remarkably accurate sensor data with minimal fingersticks with Dexcom and Medtronic sensors as well. Discuss with your diabetes care team whether it is safe for you to bypass fingersticks. Always use a fingerstick with clean hands if you have any reason to believe the sensor glucose is not accurate. And don’t make treatment decisions based on symptoms of low or high glucose, especially if how you feel is not consistent with the sensor glucose data.

Continuous Glucose Monitors Comparison

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<thead>
<tr>
<th></th>
<th>Dexcom</th>
<th>Libre</th>
<th>Medtronic</th>
</tr>
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<tr>
<td>Duration of wear</td>
<td>7 days – some people choose to wear it longer</td>
<td>10 days</td>
<td>Up to 7 days</td>
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<td>Storage</td>
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<td>36°F – 86°F Do not freeze</td>
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<td>Calibration requirements</td>
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Tips for travelling with CGMs, Insulin Pumps

By Karen Munger, MS, RD, CD, CDE, BD-ADM

The routine hassles of travel – long lines at security checkpoints, flight delays, lost luggage – are compounded when the traveler has diabetes. That’s why it’s important to plan ahead and make informed choices to help ease any potential stressors. Below are some travel tips to help those who use CGMs or insulin pumps.

- Let the TSA Security Officer at the airport know you have diabetes and are using a continuous glucose (blood sugar) monitor and/or insulin pump, and this is a prescribed medical device.
- These types of devices are not removable and need to remain connected, because sensors and infusion sets are inserted under the skin.
- All of the devices can withstand common security systems such as airport metal detectors and hand wands, but full-body or advanced imaging technology scanners used by TSA may be capable of damaging the devices. Thus, it’s recommended that alternate screening be done, such as pat-down and visual inspection of devices. The devices will be damaged by baggage x-ray machines.
- Place all supplies (such as sensors, infusion sets, batteries, and insulin with prescription label) in a separate plastic bag to hand over to the Security Officer.
- For other medical supplies, such as medications, meters and strips, check the manufacturer’s instructions or the TSA website (www.tsa.gov).
LADA: The “Other” Type of Diabetes

You’re in your mid-40s and healthy, relatively fit and close to your ideal weight. However, lately you’ve been getting up to go to the bathroom at night, sometimes twice, sometimes three times per night, and feeling a bit thirsty during the day. You haven’t been feeling well for the past week and have been suffering from nausea. While not debilitating, the nausea is getting worse although you haven’t felt like you need to throw up. Concerned that your condition isn’t improving, you go to the local emergency room to get checked out.

When the emergency room physician notes that you are thin, you share that you have always been thin and feel that your vegetarian diet has helped you keep your weight under control. When answering questions about your health and family medical history, you share that you were treated for hyperthyroidism (an overactive thyroid) 10 years ago and are now on thyroid hormone replacement medication. You add that your mother received treatment for an underactive thyroid, your maternal grandmother has insulin-dependent diabetes, and a maternal uncle also has been treated for an overactive thyroid gland.

After some medical tests are completed, the doctor delivers a confounding diagnosis: You’re told you have type 2 diabetes mellitus (T2DM) and are prescribed metformin to help lower your blood glucose (blood sugar) level. But the effect on your blood sugar is minimal. In fact, even after the addition of a second and then a third pill to control your diabetes, nothing seems to be working. You are then referred to an endocrinologist, and after new blood test results are back, you’re told you have latent autoimmune diabetes in adults, also known as LADA. What?

Latent autoimmune diabetes in adults – LADA – is a lesser-known, slowly progressive form of autoimmune diabetes mellitus that is often misdiagnosed as type 2 diabetes mellitus (T2DM) in its earlier stages. LADA should be suspected in anyone who has autoimmune markers (tested by specific blood tests) that are antibodies to pancreatic tissues. The clue for considering this unusual type of diabetes is that classic physical characteristics often associated with T2DM aren’t present. You are more likely to be at a normal weight or thin, which is a big clue. And your family medical history, as well as your personal medical history, will usually reveal other hormone disorders that are linked with an autoimmune- or antibody-associated problems, such as thyroid disease, or other family members rapidly progressing to needing insulin for their diabetes blood sugar control.

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LADA: The “Other” Type of Diabetes
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It is important to identify the correct diagnosis of LADA because appropriate treatment may slow disease progression. Unfortunately, LADA causes destruction of pancreatic islet cells (insulin-producing cells), and once this happens, the need for multiple doses of insulin injections to control blood sugar levels is the only way to treat the disease.

To better understand LADA, it’s helpful to understand the immune system. As its name suggests, LADA is an autoimmune condition that causes a person’s own immune system to attack the pancreas. The soldiers in this attack are called T-cells. T-cells are meant to target and destroy foreign invaders like viruses and bacteria. In LADA, these same T-cells get confused and destroy the person’s own islet cells, the makers of insulin in your body. We don’t have a great way to detect these confused T-cells, so we use a different type of immune marker (called an antibody) as a diagnostic marker. The amount of antibody (or titer) seems to predict progression of diabetes. The most important LADA antibody is called GAD65 and targets an enzyme (glutamic acid decarboxylase) that is present in pancreatic islet cells.

The best way to distinguish between LADA and T2DM is to perform antibody testing through blood tests. While the high cost of the tests currently prohibits universal screening for LADA, this testing is being done more frequently when the type of diabetes present in an individual remains unclear. Physicians use a specific set of clinical criteria to determine who has the highest odds of testing positive for antibodies. The following characteristics are more common in LADA than T2DM: 1) age of patient at time of diabetes onset is less than 50 years; 2) the presence of certain symptoms before diagnosis (excessive thirst, excessive urination, unintentional weight loss); 3) a normal weight at time of diagnosis; 4) a personal history of autoimmune disease; and 5) a family history of autoimmune disease. It has been reported that if these criteria are used, the diagnosis of LADA could be made in at least 90 percent of cases in which the patient meets at least two of these criteria.

It’s important to recognize LADA as early as possible so you receive appropriate treatment. There is some evidence that suggests using sulfonylureas, a class of oral diabetes medication that increases the release of insulin from pancreatic islet cells, can increase the need for multiple insulin injections. There is also some data from animal testing that shows giving GLP-1 agonists (a class of injectable diabetes medication that slows glucose absorption into the bloodstream) could help regeneration of pancreatic islet cells that produce insulin. Unfortunately, this has not yet been tested in humans.

We do know that LADA patients get less effect from oral medications that lower blood sugars than what is seen in T2DM patients. However, recommendations for a carbohydrate-managed diet and frequent exercise also apply to those diagnosed with LADA, as these lifestyle modifications help decrease insulin resistance (when insulin is present but is not working as it should) and minimize the number of medications needed to control blood sugar.

Once those with LADA lose the ability to produce insulin, they need multiple daily injections to stay healthy, just like patients with type 1 diabetes mellitus (T1DM—previously called juvenile diabetes). Patients who have higher levels of GAD antibodies often need insulin shots much sooner after a diagnosis of LADA. But curiously, if insulin is started early following diagnosis, it can slow the need for large insulin doses and multiple injections of insulin. Many individuals with LADA can go years requiring just one, two, or three units of a long-acting insulin to control their blood sugars. But this must be started early.

Like other types of diabetes, LADA can lead to development of significant complications. An acute complication that can occur when your pancreas no longer makes insulin is diabetic ketoacidosis, a life-threatening condition that develops when cells in the body are unable to get the sugar (glucose) they need for energy because there is not enough insulin to transport the sugar into the cells. When the sugar can’t get into the cells, it stays in the blood. This situation requires immediate hospitalization for intravenous insulin treatment.

There’s no difference in the risk of cardiovascular complications between those who have LADA and those with typical T2DM. Very little data is available about the prevalence of kidney and eye disease in LADA, but researchers suspect this is also similar to T2DM. Plus, there have been several small studies suggesting nerve disease might be more common in those with the LADA type of diabetes. However, individuals who have higher levels of GAD antibodies are at increased risk for complications, regardless of blood sugar levels. The best way to avoid such complications is to control blood glucose levels.

It’s very important to ask your doctor what type of diabetes you have, especially if you don’t think you fit the usual profile for T2DM. If you’re young and of a normal weight, you might need a different kind of treatment to stay healthy. So request the antibody testing – your life could depend on it.
When children with type 1 diabetes experience the everyday fun and freedom of camp with others just like them, something incredible happens. Diabetes isn’t the focus of their day. Lilly Diabetes believes that every child should have the opportunity to go to camp, and that’s why we’ve provided insulin and a variety of carefully designed resources to diabetes summer camps for more than 10 years. We help camps care for your child’s unique, personal needs so your child can focus on what’s most important — having a summer to remember.

LillyDiabetes.com
To register for a camp near you, visit www.diabetescamps.org.
Who wouldn’t like to improve their brain power – recall facts and figures more readily, solve challenging math equations, remember that grocery store list item or the exact date of an important event in the past?

Abandoning poor habits such as soda intake and developing new, healthier habits such as eating more fresh fruits and vegetables are popular resolutions with the advent of the new year. But what about starting a daily multivitamin or a B-complex? Vitamins are good for us all, right? What support is there for taking vitamins, what benefits can they offer and are they for everyone?

Let’s examine the vitamin B family. First, a few words about vitamins in general: They are compounds essential for normal body functioning that aren’t made by the human body but can be found in the foods we eat. In total, humans require adequate amounts of 13 vitamins: four fat-soluble vitamins (A, D, E and K, which are stored in our body fat, meaning they stick around longer after ingested) and nine water-soluble vitamins (those that the human body cannot store), which include vitamin C and the eight B vitamins: thiamine (B1), riboflavin (B2), niacin (B3), pantothenic acid (B5), vitamin B6, biotin (B7), folate (B9) and vitamin B12.

The B vitamins are typically manufactured by plants. The exception is vitamin B12, which is made by bacteria and is obtained from animal-derived foods such as fish, meat, poultry, eggs, milk and milk products. Fortified breakfast cereals and some nutritional yeast products are also a readily available source of vitamin B12.

Here’s where the importance of the B vitamins comes into play.
It may surprise you to know that your brain is the most metabolically active organ in your body. While only accounting for about 2 percent of body weight, it accounts for over 20 percent of your body’s total energy expenditure. The importance of the B vitamins for brain function can be inferred by the different chemical pathways that each vitamin requires to be actively transported across what is known as the blood brain barrier and/or choroid plexus, a mass of vascular tissue in brain ventricles which produces a chemical barrier that protects the brain from being bombarded by just any compound in the body.

Each B vitamin has a specific, dedicated transport mechanism for getting the vitamin from the bloodstream into the brain. Once in the brain, specific cell uptake mechanisms guide the vitamin to exact tissue distribution, with the goal of maintaining very high vitamin B levels that are tightly regulated. It’s clearly a very well-orchestrated system.

As an illustration, the brain concentration of methyltetrahydrofolate (the main circulating form of folate in the blood, which is need to make DNA and other genetic material) is four times that seen in blood, and biotin and pantothenic acid concentrations can be up to 50 times that found in your blood.

**So, is there evidence linking B vitamins to better brain power?**

Let’s look more specifically at vitamins B6, B12 and folate (B9). There is observational study data to suggest a positive link: the higher the B vitamin blood level, the better performance with tests of memory, problem-solving, and word and sentence formation. Interestingly, there seem to be as many studies suggesting no relationship.

As an example, Australian researchers Dr. Osvaldo Almeida and Dr. Andrew Ford reviewed data that combined results from 19 studies focusing on older participants and found no evidence that taking folic acid, alone or in combination with vitamins B12 and B6, improved or decreased declines in cognitive function. However, associations have been reported in other studies that link lower vitamin B12 status with decreased brain volume and increased white matter lesions that indicate an increased risk for developing dementia.

More meaningful studies are those that are called interventional studies. These require comparing a group of individuals that are tested using an intervention (in this case, taking one of the B vitamins, or a combination, on a daily basis for a defined period of time) against those that are not given the intervention, known as control subjects. In one small interventional study, taking B vitamins seemed to decrease the rate of developing brain atrophy, which has been connected to dementia and aging-related cognitive changes.

In a review of 10 separate studies involving supplementation with folic acid plus vitamin B12 (four studies) and vitamin B6 (three studies), and a single study of vitamin B12 monotherapy, results focused on depression in those with mood disorders. Combined, the studies showed no difference in the development of new depression between those who took vitamins and those who didn't. However, the studies that looked at relapse into depression seemed to support the benefits of vitamin B, specifically taking all three vitamins.

The Women’s Antioxidant and Folic Acid Cardiovascular Study involved 2,009 women aged 65 years or older who were assigned to receive either daily supplements containing 2,500 micrograms of folic acid, one microgram of vitamin B12 and 50 micrograms of vitamin B6, or a placebo (“dummy” pill). After an average of 1.2 years, those taking the B-vitamin supplementation showed no difference in cognitive changes from those taking the placebo. However, in a subset of women with low baseline dietary intake of B vitamins, supplementation significantly slowed the rate of cognitive decline.

In yet another study conducted in the U.S. that included 340 individuals with mild-to-moderate Alzheimer’s disease, taking daily supplements of 5,000 micrograms of folic acid plus 1 milligram of vitamin B12 and 25 milligrams of vitamin B6 for 18 months did not slow cognitive decline compared with the placebo.

A secondary analysis of a study conducted in Australia (which did not have mandatory folic acid fortification at the time) found that daily supplementation with 400 micrograms of folic acid plus 100 micrograms of vitamin B12 for two years improved some measures of cognitive function, particularly memory, in 900 adults aged 60 to 74 years who had depressive symptoms.

**What amounts are recommended for daily intakes of these vitamins?**

Typically, the recommended dietary allowance (RDA), which is defined as the average daily level of intake sufficient to meet the nutrient requirements of nearly all (97 to 98 percent) healthy individuals, is used as a guide. RDAs come from the Food and Nutrition Board at the Institute of Medicine (IOM) of the National Academies (formerly the National Academy of Sciences) and can be viewed online at: nationalacademies.org. The U.S. Department of Agriculture’s (USDA) nutrient database online (ndb.nal.usda.gov/ndb) lists the nutrient content of many foods and provides a comprehensive list of foods containing vitamins arranged by food name and nutrient content. See the chart on page 28 for some examples.

**Is it better to get these vitamins from foods or supplements?**

This question has always resulted in considerable debate. For folate, at least 85 percent of a folic acid supplement is estimated to be absorbable when taken with food, but only about 50 percent of the folate in foods is absorbable. For vitamin B12, results focused on depression in those with mood disorders. Combined, the studies showed no difference in the development of new depression between those who took vitamins and those who didn't. However, the studies that looked at relapse into depression seemed to support the benefits of vitamin B, specifically taking all three vitamins.

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Can Vitamin B Boost My Brain Power?
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percent of folate naturally present in food is potentially absorbable. So, for folate or folic acid needs, supplements are strongly recommended, especially during pregnancy.

As for vitamin B12, some people — older adults, those with pernicious anemia (a condition that causes loss of the production of a chemical in the stomach that helps absorb B12), and those with reduced levels of stomach acidity called hypochlorhydria or achlorhydria, or other intestinal disorders — have difficulty absorbing vitamin B12 from food and sometimes even from oral supplements. Injections of vitamin B12 might be required in this circumstance, something to be determined in discussion with your physician.

With vitamin B6, certain individuals are known to benefit more from taking supplements, including those with poor kidney function (including those on dialysis), as well as those who have undergone a kidney transplant who often have low vitamin B6 levels. People with rheumatoid arthritis often have low vitamin B6 concentrations as well, and vitamin B6 concentrations tend to decrease with increased severity of the disease. Diseases of the gut such as celiac disease, Crohn’s disease, ulcerative colitis and inflammatory bowel disease tend to cause lower B6 levels, requiring supplement use since food-based intake is often not sufficient.

Luckily for most of us, dietary sources can work well to provide these nutrients. Check out the sources mentioned for ideas on food that can supplement your vitamin intake — at the very least, they’ll help ensure your well-being and may just boost your brain power.

<table>
<thead>
<tr>
<th>Food</th>
<th>Micrograms per serving</th>
<th>Percentage of Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common food sources of Vitamin B12</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clams, cooked, 3 ounces</td>
<td>84.1</td>
<td>1,402</td>
</tr>
<tr>
<td>Beef liver, cooked, 3 ounces</td>
<td>70.7</td>
<td>1,178</td>
</tr>
<tr>
<td>B12-fortified breakfast cereals, 1 serving</td>
<td>6.0</td>
<td>100</td>
</tr>
<tr>
<td>Wild rainbow trout, cooked, 3 ounces</td>
<td>5.4</td>
<td>90</td>
</tr>
<tr>
<td>Sockeye salmon, cooked, 3 ounces</td>
<td>4.38</td>
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<tr>
<td>Light tuna fish, canned in water, 3 ounces</td>
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<tr>
<td>Double-patty cheeseburger and bun</td>
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<td>35</td>
</tr>
<tr>
<td>Haddock, cooked, 3 ounces</td>
<td>1.8</td>
<td>30</td>
</tr>
<tr>
<td>Top sirloin, cooked, 3 ounces</td>
<td>1.4</td>
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</tr>
<tr>
<td>Low-fat milk, 1 cup</td>
<td>1.2</td>
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<tr>
<td>Low-fat fruit yogurt, 8 ounces</td>
<td>1.1</td>
<td>18</td>
</tr>
<tr>
<td>Swiss cheese, 1 ounce</td>
<td>0.9</td>
<td>15</td>
</tr>
<tr>
<td>Beef taco, 1 soft taco</td>
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</tr>
<tr>
<td>Cured ham, roasted, 3 ounces</td>
<td>0.6</td>
<td>10</td>
</tr>
<tr>
<td>Hard-boiled egg, 1 large</td>
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<td>10</td>
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<tr>
<td>Roasted chicken breast meat, 3 ounces</td>
<td>0.3</td>
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<tr>
<td><strong>Common food sources of Vitamin B6</strong> **</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canned chickpeas, 1 cup</td>
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<tr>
<td>Beef liver, pan-fried, 3 ounces</td>
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<td>Fresh yellowfin tuna, cooked, 3 ounces</td>
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</tr>
<tr>
<td>Sockeye salmon, cooked, 3 ounces</td>
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<tr>
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<td>Boiled potatoes, 1 cup</td>
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<tr>
<td>Banana, 1 medium</td>
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<tr>
<td>Ground beef, 85% lean, patty, broiled, 3 ounces</td>
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<tr>
<td>Plain waffles, toasted, 1 waffle</td>
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<tr>
<td>Cottage cheese, 1% low-fat, 1 cup</td>
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<td>Raisins, seedless, 1 cup</td>
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<td>Frozen spinach, boiled, ¼ cup</td>
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<td><strong>Common food sources of Folic Acid</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Spinach, boiled</td>
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</tr>
<tr>
<td>Chicken breast, roasted, ½ breast</td>
<td>3</td>
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*Daily values (DVs) were developed by the U.S. Food and Drug Administration (FDA) to help consumers determine the level of various nutrients in a serving of food in relation to their approximate requirement for it. The DV for vitamin B12 is 6.0 micrograms.

**The DV for vitamin B6 is 2 milligrams for adults and children age 4 and older.

***The DV for folic acid is 400 micrograms for adults and children aged 4 and older.
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and (much, much) more.

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The internet’s most comprehensive source for endocrine health information, written by endocrinology experts for you.

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</tr>
<tr>
<td>Banana, 1 medium</td>
<td>24</td>
</tr>
<tr>
<td>Egg, whole, hard-boiled</td>
<td>22</td>
</tr>
<tr>
<td>Fish, halibut, cooked, 3 ounces</td>
<td>12</td>
</tr>
<tr>
<td>Milk, low-fat, 1 cup</td>
<td>12</td>
</tr>
<tr>
<td>Ground beef, 85% lean, cooked, 3 ounces</td>
<td>7</td>
</tr>
<tr>
<td>Chicken breast, roasted, ½ breast</td>
<td>3</td>
</tr>
</tbody>
</table>
The American College of Endocrinology (ACE) and the American Association of Clinical Endocrinologists (AACE) would like to thank AbbVie and Lilly Diabetes for their support of the EmPower initiative.