

- FIT TIPS -

Many pregnant clients experience extreme low back or sciatic nerve pain. Oftentimes this is symptomatic of lumbo-pelvic-hip instability, or decreased core control due to increased lordosis. One way to help increase core functioning and strengthen the glutes and abs is tube walking. Using a band resistance consistent with your client's ability, perform 2-3 sets of 12-20 repetitions of lateral tube walking (moving right and left).



Shaping the Industry:

Exercise and Pregnancy

A woman's body goes through numerous changes in preparation for birth. The adaptations that occur range from physiological to musculoskeletal and can inspire or limit a woman's exercise patterns. Despite these changes, numerous benefits of exercise have been proposed for before, during, and after pregnancy. Some studies have shown that women who actively engage in exercise have fewer of the common discomforts associated with pregnancy, such as leg cramps, swelling, fatigue and shortness of breath. There is limited research on the effects of exercise during pregnancy; however, recent studies have indicated that moderate exercise is safe for the mother and the fetus. Despite the proposed benefits, it is always safe to err on the side of caution when dealing with an expectant mother, so certain guidelines have been proposed for exercise programs for pregnant women. (See contraindications panel.)



Shaping the Industry Continued. . .

An important prerequisite to recommending an exercise regimen is understanding the changes which occur in the woman's body during pregnancy. Each individual will handle the stress of pregnancy differently, although the physiological changes occurring will be about the same. Therefore, we will explore the changes in an expectant mother's body and give exercise recommendations, precautions, and programs for each trimester, as well as postpartum.

Physiological Changes

The endocrine, cardiovascular, and musculoskeletal systems undergo significant changes in the expectant mother.

Endocrine system changes are significant in numerous ways. The enlargement of the adrenal, parathyroid and pituitary glands help support the growth of the fetus.^{1,2,4,5} Breast enlargement and connective tissue changes occur as a result of hormonal changes. **Estrogen** and **progesterone** levels begin to increase and **relaxin** is released to increase joint laxity. (To better understand the terms in bold, see the **definitions** at the end of the article.) Relaxin helps soften ligaments and fibrocartilage, primarily in the pelvis, which help enable the expulsion of the infant during birth.^{1,2} (This can also have the negative result of increasing instability of the pelvic joints.) The ribs become more mobile as the articulations with the spine are softened to allow the ribs to expand. This expansion is necessary for the enlargement of the uterus and heart. The heart becomes slightly enlarged and is displaced superiorly and to the left. The diaphragm also rises approximately four centimeters to allow greater room for the growing fetus. Gastrointestinal changes occur due to the hormonal and structural adaptations. Nausea, vomiting, changes in appetite, heartburn, abdominal pain and constipation may occur.

The thyroid gland enlarges and the basal metabolic rate increases by as much as 15 to 30 percent. Due to this change, the pregnant woman will have to consume anywhere between 300 and 500 kilocalories more per day to meet her metabolic needs (the non-exerciser needing around 300 kcalories more and the exercising woman around 500 kcalories more). The thermoregulatory abilities of the body are affected by the endocrine system changes as well. Increased metabolism will result in increased excess heat. The sweat glands will have to work harder to help dissipate heat. Therefore, keeping your client hydrated and in a comfortable temperature is necessary when training.

Cardiovascular system changes include increases in blood volume, heart rate, **cardiac output** and stroke volume. Red blood volume increases by approximately 50 percent by the third trimester. Stroke volume also rises which, in turn, increases cardiac output about 40 percent above normal values. The heart rate will increase about 10 to 15 beats per minute more than normal due to the additional work the heart must do to pump the increased blood volume throughout the body. An increase in body weight means that more oxygen-approximately 10 to 20 percent more-has to be delivered during daily activities and exercise. Since oxygen is delivered via the blood, and exercise increases the demand for oxygen, there is a risk that blood flow will be shunted from the uterus and delivered to the skeletal muscles instead. (Research has not proven this, however.¹) With increasing body weight, more oxygen will be required. This will ultimately result in a lower work-capacity since the pregnant client will reach maximal exercise capacity at a lower level of work.^{1,2,4,5}

Absolute Contraindications to Exercise During Pregnancy:

1. Hemodynamically significant heart disease
2. Restrictive lung disease
3. Incompetent cervix/cerclage
4. Multiple gestation at risk for premature labor
5. Persistent second- or third-trimester bleeding
6. Placenta previa after 26 weeks of gestation
7. Premature labor during the current pregnancy
8. Ruptured membranes
9. Preeclampsia/pregnancy-induced hypertension

(ACOG Committee Opinion No. 267)³

Pregnancy Continued. . .

Musculoskeletal changes occur and are extremely significant. We consider these changes "postural distortion patterns" (please refer to the table below). In addition to the other changes listed above, a woman's structure must adjust to house the developing fetus. Due to the position of the uterus, the development of the baby will shift the expectant mother's center of gravity upward and forward. Joint laxity allows for this shift, as the ribs and the pelvis expand. This expansion has to be supported by the spine as well. The lordotic curve of the woman's spine will increase and the pelvis will become more anteriorly shifted due to the position and weight of the child. For purposes of compensation, the kyphotic curve will increase as well to counteract the increased lordotic curve and due to the enlargement of the breasts. The cervical spine will be affected as well. As the shoulders become rounded, the head will begin the shift forward. When this occurs, the posterior sub-occipitals may increase activity to extend the head on the neck to keep the eyes level (optical righting reflex).¹ The weight gain a pregnant woman encounters and increased joint laxity may result in increased pronation at the foot and ankle. Combined with the postural distortions listed above, these significant alterations will ultimately affect the mechanics of the kinetic chain.^{1,2,6,7,8}

FIRST TRIMESTER

First and foremost, an assessment is necessary for designing a program that will complement your pregnant client's needs. We at NASM suggest using the Integrated Fitness Profile to gauge a starting point and find out about any postural imbalances your client may have. By addressing these needs first, you could be alleviating pain and extreme discomfort down the road as well as finding more success in designing the correct program for each individual client. Some of the common imbalances you may see in your client are described in the following table.

Addressing these imbalances in the first trimester will help strengthen your client for the trimesters to follow. Strength and flexibility go hand-in-hand. While this article focuses primarily on the strength-

training portion of program design, in order to be successful, all components of program design need to be addressed. For a more comprehensive training program, please refer to the article titled "Integrated Flexibility Training for Pregnant Clients."

First Trimester

The first trimester may be emotionally and physically exhausting for the pregnant client. With so many changes occurring in her body, fatigue and nausea may inhibit a woman from participating in any exercise program. Be alert to your client's energy levels and be sure to have a medical release from her doctor before you begin.

If your client is a beginner to exercise, a full 60-minute strength training program may be a bit overwhelming. Ease your client into each program with a warm-up and flexibility routine. It is best to address the specific weaknesses in your client during this first trimester since the client can move more easily. We suggest addressing the specific imbalances first by starting your client in a Corrective Exercise Training (CET) regimen. By helping to strengthen areas such as core, balance and the intrinsic stabilizers, you are providing a stable base for the client and helping alleviate musculoskeletal stresses that she will encounter in later months.

Relative Contraindications to Exercise During Pregnancy:

1. Sever anemia
2. Unevaluated maternal cardiac arrhythmia
3. Chronic Bronchitis
4. Poorly controlled type 1 diabetes
5. Extreme morbid obesity
6. Extreme underweight (BMI <12)
7. History of extremely sedentary lifestyle
8. Intrauterine growth restriction in current pregnancy
9. Poorly controlled hypertension
10. Orthopedic limitations
11. Poorly controlled seizure disorder
12. Poorly controlled hyperthyroidism
13. Heavy smoker

(ACOG Committee Opinion No. 267)³

will encounter in later months. Stabilization training is an integral component in strength training. The kinetic chain's stabilization system has to function optimally in order for the strength and power in the prime movers to be recruited optimally.^{6,7} Therefore, in CET training, we work on enhancing the pregnant client's intrinsic stabilizers. Remembering the specific

| | Postural Distortion Patterns | Short/Tight muscles | Long/Weak muscles |
|------------|------------------------------|--|--|
| FOOT/ANKLE | Feet externally rotated | Soleus/gastrocnemius | Anterior/posterior tibialis |
| | Pronation at ankle | Soleus/gastrocnemius Peroneals | Anterior/posterior tibialis |
| KNEES | Adducted/ internally rotated | Adductors IT-band | Gluteus medius Gluteus maximus Hip external rotators |
| HIPS | Anterior pelvic tilt | Iliopsoas Rectus femoris Erector spinae Latissimus dorsi | Gluteus maximus Inner unit |
| SHOULDERS | Protracted shoulder girdle | Pectoralis major/minor Latissimus dorsi | Scapular retractors: Rhomboids Mid/lower trapezius Rotator cuff |
| HEAD | Cervical extension | Sternocleidomastoid Upper trapezius Scalenes Levator scapulae | Deep cervical flexors |

adaptations and common muscular imbalances that occur during pregnancy, the following program will strengthen specific areas susceptible to lengthening and weakness.

Begin your client with one set and increase the number of sets as she becomes better adjusted to exercise. Keep the resistance light to moderate. Keeping the volume and intensity low will help her to recover properly and not place too much stress on her or her developing fetus.^{1,2,3}

What if my client has been training previously and wants a more aggressive program?

The novice pregnant client can begin in the Integrated Stabilization Training (IST) phase. This is the client who has been exercising regularly and wants to continue training through her pregnancy. Again, we need to assess her movement patterns for muscle imbalances and then address them cautiously with the correct warm-up and flexibility program (see adjoining article titled "Integrated Flexibility for Pregnant Clients"). In IST training, we are still working on training the intrinsic stabilizers but we are increasing the volume and intensity slightly. Since we must meet the desires of the novice client, adding intensity and volume will give her what she wants and what she needs.

For the first trimester, most exercises can be done; however, energy levels must be continually assessed. Be sure to have your client work the pelvic floor muscles by performing Kegal exercises. Instruct her to contract the pelvic floor musculature and hold for approximately five seconds each repetition. Try to get her to work up to about 5 sets of 10 reps a day. If your client does not know how to contract her pelvic floor, instruct her to envision starting and stopping a flow of urine. A strong pelvic floor can help relieve incontinence and pelvic pain from muscle spasms. Remind her that this is one of the most important exercises she can do and that these exercises should continue throughout the pregnancy.¹

Take special precautions with your client. Keep plenty of water handy, an energy

bar to help her energy levels and, if possible, keep the room temperature moderate. Energy levels and the level of exercise-induced fatigue will begin to change. Your client may not be aware of these changes or she might try to ignore them. Be aware of her moods and behaviors. Remember the contraindications listed in the panels above and modify each program according to the special needs of your client.

The Second & Third Trimester

In the second trimester (12 to 24 weeks) your client may experience a burst in energy levels. Gastrointestinal and digestion discomfort may have lessened and your client may be feeling much better. By this time in the pregnancy, the client has gained significantly more weight, and she is beginning to "show." Be aware that the emotional state of your client may also change. She may not be comfortable with the weight gain, or she may be feeling emotional about becoming a parent. Positive reinforcement and assurance will help motivate her to continue her exercise program.

The third trimester will be accompanied by more weight gain due to the growth of the fetus. The client must be kept stable to prevent falls which could occur due to the extreme shift in her center of gravity. In this trimester, be very watchful of your client's conditions, and reduce exercise intensities and duration. Keep the client in cool conditions to prevent overheating and make sure she is well hydrated. Keep a bottle of cool water handy just in case.

There are a few modifications that must be made when training in the second and third trimesters. Keep your client seated, or standing on two legs, to maintain a more stable base of support. Your client should not stand in the same position for extended periods of time and should avoid exercises that can increase pelvic asymmetries (e.g. lunges). Adding pelvic tilts, front to back and side-to-side, whether on the ball or in a quadruped position will allow the client to continue working the core musculature and even help alleviate back discomfort. Avoid extreme supine positions and prone positions where your client is asked to rest on

her stomach. As your client's baby begins to grow, prone positions will become increasingly uncomfortable and impossible. Supine positions that require your client to lie flat on her back might contribute to **vena cava syndrome**. This condition occurs when the developing fetus is pressed up against the aorta and inferior vena cava causing an occlusion due to the increasing weight and size of the fetus. This obstruction of venous return may decrease cardiac output.^{1,2} The signs and symptoms of this are listed below:

- Faintness
- Dizziness
- Restlessness
- Nausea and vomiting
- Chest / abdominal discomfort or pain
- Numbness or paresthesia in the limbs
- Headache
- Cold legs
- Weakness
- Fatigue (more than typical)^{1,2}

The typical pregnant client can continue to train in a CET phase for the duration of the pregnancy. **ALWAYS EXERCISE PRECAUTION** when working with the pregnant client. If problems or discomfort arise, stop exercise and notify your client's physician immediately.

Postpartum

Exercise recommendations for the postpartum client require a gradual return to exercise. The effects of relaxin may last up to 12 weeks, or longer if she is breast feeding, and it is noted that return to the pre-pregnant state takes about six to eight weeks.^{1,2} However, remind your client that resumption of Kegal exercises can begin as early as 24 hours after delivery and will assist her in her recovery process. Use the same precautions as during pregnancy and inform your client that, if she chooses to breast feed, she must maintain an intake of about 500 kilocalories above maintenance levels.

Exercise during pregnancy has recently seen less stringent guidelines. First and foremost, a client must have a physician's approval and undergo a thorough assessment process. Always watch for contraindications for exercise, and take

Shaping the Industry Continued...

care to ease your client's activities, and remember that there is no **one** program that reigns superior to others. Exercise caution and always be aware of your client's moods, energy levels and capabilities.

Definitions (*The Bantam Medical Dictionary, 3rd ed. 2000.*)

1. **Estrogen** - One group of steroid hormones that control female sexual development, promoting the growth and function of the female sex organs and female secondary sexual characteristics (such as breast development).
2. **Progesterone** - A steroid hormone secreted by the corpus luteum of the ovary, the placenta and the adrenal cortex. It is responsible for preparing the inner lining (endometrium) of the uterus for pregnancy.
3. **Relaxin** - A hormone secreted by the placenta during pregnancy. It yields connective

tissue laxity.

4. **Cardiac output** - The volume of blood expelled by either ventricle of the heart, per unit of time, usually measured as volume per minute.
5. **Vena cava syndrome** (a.k.a. supine hypotensive syndrome) - A condition in which the inferior vena cava becomes obstructed by the enlarged fetus and venous return lessens, decreasing cardiac output.
6. **Kinetic chain** - The combination and interrelation of the nervous, muscular, and skeletal systems.
7. **Endocrine system** - The endocrine glands-the pituitary, thyroid, parathyroid and adrenal glands-that manufacture and secrete hormones.

References

1. Strauhal MJ. Therapeutic Exercise in Obstetrics. Chpt. 13: 213-230.
2. Stephenson RG. Lumbopelvic Dysfunction During Pregnancy and the Postpartum Period.

- Stephenson Physical Therapy. APTA Orthopaedic Interventions for Selected Disorders Home Study Course 12.2.3.
- 3 American College of Obstetricians and Gynecologists. Committee Opinion; Exercise During Pregnancy and the Postpartum Period. No. 267. January 2002.
- 4 Andrews L. The Pregnant Client. IDEA Personal Trainer. Sept. 1996.
- 5 Cowlin AF. Women's Fitness Program Development. Yale University: Human Kinetics; 2002.
- 6 Clark MA, Corn RJ. Optimum Performance Training for the Fitness Professional. Thousand Oaks, CA: National Academy of Sports Medicine; 2001.
- 7 Clark MA, Russell A. Optimum Performance Training for the Performance Enhancement Specialist. Thousand Oaks, CA: National Academy of Sports Medicine; 2001.
- 8 Cowlin AF. Women's Fitness Program Development. Yale University: Human Kinetics; 2002.

Behind the Scenes:

Battling Sacroiliac Pain During Pregnancy

Often, pregnant clients will complain of a deep, stabbing pain in the buttocks which may radiate into the posterior thigh or knee. This pain is frequently caused by pressure applied to the sciatic nerve by the piriformis due to the passage of the nerve through or under the muscle. Pain associated with this problem often mimics the signs and symptoms of lumbar nerve root compression or sciatica in the buttock and posterior leg. The client will often report sciatica-type symptoms and experience tenderness in the piriformis fossa. Pain when sitting is common, as is pain with hip flexion, adduction, internal rotation, walking, and unilateral standing.

If the practitioner considers the principles of the kinetic chain and dysfunction of its linked components, it is not difficult to hypothesize why the piriformis may become involved in an impingement of the sciatic nerve. If the client has chronic tightness of the hip flexor (iliopsoas), the gluteus maximus will become reciprocally inhibited. This is significant because of the functional responsibility of the

glute to decelerate medial femoral rotation during heel strike or functional movements. Since the piriformis is a primary external rotator of the femur, it becomes synergistically dominant in controlling the femur. This type of dominant function has the potential for causing the spasm, hypertrophy, or tightness.

If the client displays external rotation of the knee and lower extremity during the overhead squat, this may be associated with a tight piriformis. Correlating the overhead squat findings and utilizing a goniometric assessment to measure the degree of internal rotation of the femur might be necessary to classify this muscle imbalance.

An effective strategy for correcting this type of dysfunction would be to first release the hip flexor through appropriate integrated flexibility techniques, as well as the piriformis; then implement reeducation of the gluteus maximus through isolated strength training; and, finally, recondition the lumbo-pelvic hip complex through integrated functional movements in



the appropriate range of motion, plane of motion, and speed, specific to the needs of the client.

If the pain persists, modify the exercise to avoid aggravating the condition while you are working on a corrective solution with your client. Avoid single-leg conditions, work to strengthen the gluteals complex, and stabilize the pelvis through exercises such as lateral and front-to-back toe walking. Always consult with the client's physician and refer out if the pain continues or worsens.

Nutrition Continued. . .



goals. If rapid weight loss is desirable, then the decision possibly to bottle feed the infant should be discussed with her physician.

Protein Requirements

The continuous production of milk during lactation increases the demand for protein. An average of 6 percent of breast milk is protein.²¹ The RDA of protein during lactation is 1.1 g/kg/day or an additional 25 grams per day. As previously discussed, specific protein requirements should be taken into consideration by women who exercise regularly.

Iron Requirements

Iron requirements during lactation call for a decrease in dosage. Because iron is not a primary nutrient component of breast milk, no additional amount is required. In fact, the RDA calls for a reduction of the recommended 27 mg during pregnancy to 9 mg during lactation.⁵

Fluid Intake Recommendations

During lactation, the fluid requirements of the mother will increase above the amount recommended during pregnancy. Roughly 87 percent of breast milk is water and the mother secretes approximately 750 ml/day during the first six months of lactation. It is recommended that the lactating mother

consume an additional 600 to 700 ml (up to 24 oz.) of water per day above pre-pregnancy consumption.⁵

Proper Supplementation During Lactation

The importance of supplementation remains during lactation. Breast milk will be the main source of nutrients to the infant for a period of time; therefore, nutrient needs remain high through lactation. Also, many nutrients may be required in higher amounts during lactation in comparison to pregnancy.^{2,5,6} Many of the micronutrients are hard to obtain from food alone and the necessity for the fetus to drink nutrient-dense milk is crucial for its development. The mother should be as diligent concerning her nutrition as she was during pregnancy and should remain on her prenatal multivitamin throughout lactation. The continuation of the calcium supplement will depend on the current level of intake from food.

Summary

The mother-to-be goes through many decisions and faces many changes. With prudent food and supplement choices, she can avoid known risks to her health and the health of her baby. Nutrition, supplementation with a prenatal multivitamin, fluid intake and rest are crucial to bringing a healthy fetus to full term. Other considerations

include a safe and appropriate exercise routine. These can significantly improve energy, mood, maintenance of lean tissue, and strength. Further, stress, blood pressure, and labor time can be reduced, and recovery from delivery is usually faster for women who exercise. These are the tools that a woman has to provide the absolutely best environment for her baby's growth and development, as well as the best care for herself during this unforgettable time in her life.

***Always consult your physician before starting an exercise regimen.**

Additional nutrition resources for pregnancy and lactation:

American Dietetics Association - National Center for Nutrition and Dietetics

216 W. Jackson Blvd., Suite 800, Chicago, IL 60606-6995
(800) 366-1655 for referrals to a RD
(800) 877-1600 ext. 4774 for lit/database searches for a fee
www.eatright.org

American College of Obstetricians and Gynecologists

Office of Public Information, 409 12th St. SW, Washington, DC 20024-2188. Phone: (202) 638-5577

Food and Nutrition Information Center, National Ag. Library, ARS, USDA, Room 304, 10301 Baltimore Ave., Beltsville, MD 20705-2351

Phone: (301) 504-5719; Fax: (301) 504-6409 www.nal.usda.gov/fnic

March of Dimes Birth Defects Foundation Resource Center

1275 Mamaroneck Ave., White Plains, NY 10605
Phone: (888) MODIMES (663-4637); Fax: (914) 997-4763
www.modimes.org

International Lactation Consultant Association

200 North Michigan Avenue, Suite 300, Chicago IL 60601
Phone: (312) 541-1710; Fax: (312) 541-1271 www.ilca.org

~~References (see page 4)~~



Fuel for the Body:

Nutrition for Pregnancy and Lactation

Troy Trevino BS, NASM- CPT
Apex Fitness Group
www.apexfitness.com

Pregnancy is a very special and crucial time in a women's life with respect to her health and the health of her growing fetus. A women's body will undergo dramatic changes during this time. For example, blood volume will increase up to 50 percent. The uterus and its supporting muscles will increase in size and strength.

The joints, with the help of the hormone relaxin, will become more flexible in preparation for birth. The women's body in response to high levels of estrogen will retain more water and breast volume will increase in preparation for lactation. For many, pregnancy can be the driving force that motivates diligent adherence to an exercise regimen and proper nutrition habits. The mother's choices in nutrition and exercise will be vital to support both her health and the growth and development of her fetus.

Healthful Weight-Gain Recommendations

It is important to understand that mothers-to-be may be looking to minimize gains of body fat. But it is critical to reinforce the importance of weight gain during pregnancy. Low birth weight (less than 5.5 pounds) is a predominate factor in two thirds of all infant deaths. Infant deaths due to low birth weight are thirty times more frequent than deaths of newborns of normal weight. It appears that nutritional status and low pre-pregnancy weight negatively influence the birth weight of the baby.¹ To decrease the risk of complications and low birth weight, the American College of Obstetricians and Gynecologists (ACOG) supports the guidelines devised by the

National Academy of Sciences recommending a weight gain of 27.5 to 40 lbs. for underweight females, 25 to 35 lbs. for normal weight females and 15 to 25 lbs. for overweight females.² (See Table 1.³) This gain in weight should not only come from the development of the fetus and extra water, but from increases in adipose tissue and lean body mass. The additional stored energy will be needed to support the increased demands of the mother and fetus.

Table 1.³ Recommended Weight Gain for Pregnant Women based on Body Mass Index BMI = weight (kg)/height (m)²

| | Total weight gain | 1 st Trimester gain | 2 nd & 3 rd Trimester weekly gain |
|-------------------------------|-------------------|--------------------------------|---|
| Weight Category Based on BMI | LBS. | LBS. | LBS. |
| Under weight (BMI < 19.8) | 28-40 | 5 | 1.07 |
| Normal weight (BMI = 19.8-26) | 22-35 | 3.5 | 0.97 |
| Over weight (BMI > 26-29) | 15-25 | 2 | 0.67 |
| Obese (BMI > 29) | At least 15 | | |

Conversely, about 50 percent of women in the United States⁴ are considered overweight and/or obese (defined as a body mass index > 26); therefore, education and prevention of excessive gestational weight gain should also be consid-

ered. Pregnancy for some women is tagged as an excuse to be able to eat anything and everything they want, in effect allowing their weight gain to exceed those set by the standard healthful guidelines. Obese women have a higher incidence of obstetrical complications including prolonged labor, pyelonephritis (infection of the bladder, spreading up to the kidney), diabetes, hypertension, and thromboembolism (blockage of a blood vessel). The associated health risks not only put the mother at risk, they endanger the growing fetus.

Energy Requirements

The demand for energy during pregnancy is high. Not only does the mother need to support her maternal

Fuel for the Body Continued. . .

requirements, but also the requirements of the fetus. The mother's basal metabolism can increase by 25 percent during pregnancy, leading to an estimated additional 80,000-Calorie expenditure for the average woman during the full term of the pregnancy.⁵ The Calorie recommendations for the mother may depend on the stage of pregnancy, her pre-pregnancy weight, level of activity, and the physician's recommendation. The recommended dietary allowance (RDA) of Calories for the pregnant client is maintenance for the 1st trimester.² Nausea may ensue during these first three months and the goal of the expectant mother is to consume the recommended number of Calories. After the 1st trimester, an increase of 300 to 500 total Calories for the remaining 2nd and 3rd trimester is recommended, depending on the individual.⁶ Keep in mind the additional Calories also supply additional nutrients. To fulfill the addition of 300 to 500 Calories, food choices should be nutrient-dense. Lean proteins, dark green vegetables, whole grain breads, and citrus fruits are some good choices for the increase in Calories. The rate of weight gain recorded during regular doctor visits will be the most useful indicator of adequate energy intake.

Because the caloric recommendations specified are so important to the mother and the growing fetus, knowing how to estimate maintenance Calories is imperative. The Apex software, if it is available to you will calculate the basal metabolic rate from the data entered and calculate the maintenance caloric levels from the current activity level entered for that individual. It does this by calculating BMR using the Harris-Benedict equation and uses multipliers for the activity levels. If the software is not available to you, you can use the Daily Calorie Needs calculator on the www.apexfitness.com website to give you a close estimate. However, it is important to always refer to your client's doctor for approval and to

Good Food Sources of these B-Complex Vitamins

| THIAMINE B ₁ | RIBOFLAVIN B ₂ | NIACIN | VITAMIN B ₆ | FOLIC ACID |
|----------------------------|------------------------------|---------------|---------------------------|-------------------|
| Whole grains | Milk | Whole grains | Whole grains | Liver |
| Cereals | Cheese | Nuts | Poultry | Eggs |
| Pork | Yogurt | Peanut butter | Liver | Green leafy veg. |
| Organ meats | Eggs | Peas | Other meats | Mushrooms |
| Spinach | Liver | Beans | Bananas | Nuts |
| Peas | Other meats | Liver | Eggs | Peas |
| Lima beans | Green leafy veg. | Poultry | Fish | Beans |
| Nuts | Whole grains | Other meats | Potatoes | Potatoes |
| | Nuts | Fish | Green leafy veg. | Rice |
| | Peas | Milk | | Whole wheat bread |
| | Beans | Eggs | | |

ensure the Calories recommended are appropriate.

Nutrient Recommendations

The increase in demand for energy is equaled by a strong demand for more nutrients. The mother's diet and nutrient stores are the fetus' only source of nutrients; therefore, great nutrient demand is placed on the mother. Some nutrients will be shored up by the increase in the caloric recommendation. Something to consider, however, is that many micronutrients are difficult to obtain from food alone.

Protein

Due to the growth of the placenta and fetus, production of breast milk, and the increase in blood volume, the need for protein in the mother's diet increases by approximately 25 g/d for the average female.^{5,6} The current RDA for pregnancy is 1.1 g/kg/day of protein, or an additional 25 grams per day. Areas for consideration in regard to protein intake are the current activity level of the woman. The RDA for protein for a non-pregnant female is 0.8 grams of protein per kilogram of body weight per day. If the expectant mother is exercising regularly, she will have a heightened need for nutrients to also support the increase in her energy expenditure through exercise. The protein recommendation for a recreational athlete (exercising consistently at moderate activity three times per week for at least 30 minutes) is 1.2 to 1.8 g/kg/d during the adaptation phase. These considerations should be taken into account when the woman is exercising consistently during her pregnancy.

The requirement for vitamin B₆ in pregnant women is increased with the protein requirements. This increase raises the requirements associated with the synthesis of nonessential amino acids in growth and vitamin B₆-dependent niacin synthesis from tryptophan.¹ Vitamins thiamin (B₁), riboflavin (B₂), and niacin are also increased for the mother because these nutrients are utilized in the production of energy from food.

Folic Acid and B₁₂

Folic acid is one of the B-complex vitamins and is an essential nutrient. It is needed by the body to help make the genetic materials DNA and RNA, and to manufacture blood cells,^{2,5,6} especially during the 1st trimester of pregnancy.⁷ Folic acid deficiency, both pre-conception and during pregnancy, is associated with an increase in neural tube defects and other malformations which form early in the fetus.^{5,6} The RDA for folic acid (folate) during pregnancy is 600 mcg to prevent neural tube defects such as spina bifida, which affects the brain and/or spinal cord. Extensive research has found that adequate intake of folic acid leads to fewer malformations, especially neural tube defects.^{6,8,9,10,11} According to the National Health and Nutrition Examination Survey II, folate intake is low in women in the US, caused by poor food selection and folate loss during cooking.⁶ Vitamin B₁₂ is required in higher amounts during pregnancy because of its synergistic relationship to folic acid. It is used to help activate folate in the body.

Nutrition Continued. . .

Iron

Iron, an essential mineral for both the mother and fetus, aids in manufacturing the extra red blood cells needed for the significant increase in the mother's blood supply. Not only does this serve the needs of the growing fetus, it also protects the mother's health in preparation for delivery. Women of childbearing age are at greatest risk for iron deficiency even before conception, due to menstruation and inadequate diet.^{2,5,6}

Pregnancy further depletes the mother's stores, and maternal anemia is common.¹ Increased iron absorption occurs with pregnancy, but maternal stores are nevertheless easily depleted.^{1,8} During the last trimester of pregnancy, iron demand by mother and fetus is the greatest.^{6,12} The fetus draws iron from the mother to create its own stores for times when milk, a low-iron food, will be its sole form of nourishment. Low maternal iron stores during pregnancy directly correlate with preterm delivery, low birth weight, and maternal infection.^{6,13,14} The RDA recommendation for iron is 27 mg per day. This is very difficult to obtain through food sources alone, so an iron supplement is usually suggested for the 2nd and 3rd trimesters, with a physician's approval.

Calcium

Calcium is important for all women, but especially during this period of her life. The fetus uses calcium for skeletal bone mineralization.⁶ During pregnancy, calcium stores are greatly mobilized. Studies suggest that inadequate calcium intake of < 2 grams results in the mother's stores being used to supply fetal needs.³ The RDA recommendation is 1,000 mg; however, some researchers suggest an increase up to 2,000 mg/day to supply the fetus' needs, sparing the maternal stores of the mineral. Because vitamin D assists in calcium absorption and utilization, and magnesium aids in calcium homeostasis, vitamin D and magnesium are important nutrients to ensure the best utilization of calcium by the mother and

the fetus. Low intakes of these three micronutrients can result in abnormalities in the infant's teeth and bone structure. The risk to the mother is that inadequate intakes during this period can increase the risk of osteoporosis later in life. Adequate calcium intake during pregnancy has been related to a reduced risk of preterm delivery and low birth weight.¹⁵ It has also been linked to a lower risk of hypertensive disorders during pregnancy.¹⁶

Fluid Intake Recommendations

Fluid intake for the mother is vital due to the increase in blood volume, the needs of the fetus, and amniotic fluid. Minimum water recommendations are between 1,000 and 1,500 ml per 1,000 kcal ingested, or 8 to 12 cups total/day.¹⁷

Rationale for Prenatal Supplementation

It is evident how crucial vitamins and minerals are to the pregnant women's health. The majority of Americans do not meet the RDA from food alone. This fact, along with the pregnant women's increased needs, qualifies the need for supplementation.^{2,8} That said, it is vital for all women of childbearing years, either planning for pregnancy or not specifically protecting themselves against it, to investigate the use of a prenatal vitamin complex. Many pregnancies are unplanned. During the crucial beginning weeks of growth the mother may not realize that she is pregnant. Numerous studies have found that a mother's total nutrition status before and during pregnancy has a great impact on the status of her fetus as well as her own health. A prenatal multivitamin that is fortified with nutrients designed to fulfill conditional needs of pregnancy can reduce the occurrence of prenatal complications.¹⁸ If the physician has not prescribed a prenatal supplement, Apex Fitness offers a prenatal multivitamin.

While the supplement industry is unregulated, Apex Fitness Group utilizes a licensed pharmaceutical manufacturer for the production of this Apex

supplement. The prenatal multivitamin should be the pregnant woman's sole source of supplementation. In other words, it should take the place of her current multivitamin and antioxidant. Additional supplements such as calcium and iron should be investigated and discussed with her doctor in the event the need arises for the minerals because of lack thereof in the diet.

The Lactating Female

Lactation is the production and secretion of milk after childbirth. Breast-feeding not only supplies the infant with nutrient rich milk, but can supply ample bonding time between mother and baby. As in pregnancy, proper nutrition is crucial during this time in the mother's life because her food choices will ensure the proper nutrients are being supplied to the child.

Energy Requirements

Energy needs for the new mother during lactation will be even higher than during pregnancy. Post-birth lactation may increase energy requirements 23 percent above the non-pregnant, non-lactating female's energy needs; whereas, pregnancy alone may raise energy demand 14 percent.⁵ Many mothers may be eager to lose the "baby weight"; however, as during pregnancy, her attention should remain on the health and continuing growth and development of the baby. Because the mother is still the primary source of the infant's nutrition, her choices in this arena are still critical. Losing weight too quickly can affect the nutrient levels and volume of breast milk and risk the baby's development. A recent study in *The New England Journal of Medicine* showed that a moderate caloric deficit of 35 percent through diet and exercise did not affect milk volume and appears to be safe for breast-feeding mothers.¹⁹ Females who are overweight before pregnancy and who gain more than the recommended amount would profit from pre- and postnatal diet and exercise intervention.²⁰ Any female who is breast-feeding should discuss with her physician limitations in the safe pursuit of her weight-loss