ASMBS Bariatric Nutrition Guidelines

(American Society of Metabolic and Bariatric Surgeons)
Society of Obesity and Related Disease Publication - August 2008

(L. Aills et al. / Surgery for Obesity and Related Diseases)

Information compiled by a panel of bariatric surgeons, bariatrician MDs, nutritionists, nurses and nutrition scientists.

Excerpt taken from full report. (Pages 7-8)

Supplement	AGB (Adjustable Gastric Band)	RYGB (Roux-en-Y)	BPD/DS (Duodenal Switch)	Comment
Multivitamin-mineral supplement • A high potency vitamin containing 100% of daily value for at least 2/3 of nutrients • Begin with chewable or liquid • Progress to whole table/capsule as tolerated • Avoid time-released supplements • Avoid enteric coating • Choose a complete formula containing at least 18mg iron, 400 ug folic acid, as well as selenium and zinc in each serving • Avoid children's formulas that are incomplete • May improve gastrointestinal tolerance when taken close to food intake • May separate dosage • Do not mix multivitamin containing iron with calcium supplement, take at least 2 hours apart • Individual brands should be reviewed for absorption rate and bioavailability • Special bariatric formulas are available	**100% of daily value**	**200% of daily value**	**200% of daily value**	Begin on day 1 after hospital discharge
Additional cobalamin (Vitamin B12) • Available forms include sublingual tablets, liquid drops, mouth spray or nasal gel/spray • Intramuscular injection	**---**	**1000ug/mo**	**---**	Begin 0-3 months after surgery
• Oral tablet (crystalline form) • Supplementation after AGB and BPD/DS might be required	**---**	**300-500 ug/d**	**---**	

Supplement	AGB (Adjustable Gastric Band)	RYGB (Roux-en-Y)	BPD/DS (Duodenal Switch)	Comment
Additional Elemental Calcium • Choose a brand that contains calcium citrate and Vitamin D3 • Begin with chewable or liquid • Progress to whole tablet/capsule as tolerated • Split into 500-600mg doses; be mindful of serving size on label • Space dose evenly throughout day • Suggest a brand that contains magnesium, especially for BPD/DS • Do not combine calcium with iron-containing supplements: 1) to maximize absorption and 2) to minimize gastrointestinal intolerance • Wait ≥ 2 hours after taking multivitamin or iron supplement • Promote intake of dairy beverages and/or foods that are significant sources of dietary calcium in addition to recommended supplements, ≤ 3 servings daily • Combined dietary and supplement calcium intake > 1700mg/day might be required to prevent bone loss during rapid weight loss	**1500 mg/day**	**1500-2000 mg/day**	**1800-2400 mg/day**	Can begin on day 1 after hospital discharge or within 1 month after surgery
Additional elemental iron • Recommended for menstruating and those at risk of anemia • Begin with chewable or liquid • Progress to tablet as tolerated • Dosage may need to be adjusted based on biochemical markers (lab results) • No enteric coating • Do not mix iron and calcium supplements, take ≥ 2 hours apart • Avoid excessive intake of tea due to tannin interaction • Encourage foods rich in heme iron • Vitamin C may enhance absorption of non-heme iron sources	**---**	**Minimum 18-27 mg/day elemental**	**Minimum 18-27 mg/day elemental**	Begin on day 1 after hospital discharge

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Supplement	AGB (Adjustable Gastric Band)	RYGB (Roux-en-Y)	BPD/DS (Duodenal Switch)	Comment
Fat-soluble Vitamins • With all procedures, higher maintenance doses may be required for those with history of deficiency • Water-soluble preparations of fat-soluble vitamins are available • Retinol sources of Vitamin A should be used to calculate dosage • Most supplements contain a high percentage of beta carotene which does not contribute to Vitamin A toxicity • Intake of 2000 IU Vitamin D3 may be achieved with careful selection of multivitamins and calcium supplements • No toxic effect known for Vitamin K, phytonadione (phyloquinone) • Vitamin K requirement varies with dietary sources and colonic production • Caution with Vitamin K supplements should be used for patients receiving coagulation therapy • Vitamin E deficiency is not prevalent in published studies	**---**	**---**	**10,000 IU Vitamin A** **2000 IU Vitamin D** **300 ug Vitamin K**	
Oral Vitamin B Complex • B-50 dosage • Liquid form is available • Avoid time released tablets • No known risk of toxicity • May provide additional prophylaxis against B-Vitamin deficiencies, including thiamin, especially for BPD/DS procedures as water-soluble vitamins are absorbed in proximal jejunum • Note: >1000mg of supplemental folic acid, provided in combination with multivitamin, could mask B12 deficiency	**1 per day**	**1 per day**	**1 per day**	May begin on day 1 after hospital discharge

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Common Nutrient Deficiencies

*This information refers to the **general population**, not just the WLS community.*

Also remember that after gastric bypass surgery we are not fully able to absorb micronutrients (vitamins and minerals) from the food we eat – thus the need to a lifetime of taking vitamins and supplements.

Nutrient	Incidence of Deficiency	Typical Symptoms and Diseases	Natural Sources of Nutrient
Biotin	Uncommon	Dermatitis, eye inflammation, hair loss, loss of muscle control, insomnia, muscle weakness	chard, tomatoes, romaine lettuce, carrots, almonds, chicken eggs, onions, cabbage, cucumber, cauliflower, goat's milk, cow's milk, raspberries, strawberries, halibut, oats, and walnuts.
Calcium	Average diet contains 40 to 50% of RDA*	Brittle nails, cramps, delusions, depression, insomnia, irritability, osteoporosis, palpitations, periodontal disease, rickets, tooth decay	blackstrap molasses, Swiss chard, yogurt, kale, mozzarella cheese, cow's milk,goat's milk, Basil, thyme, dill seed, cinnamon, and peppermint leaves, romaine lettuce, celery, broccoli, sesame seeds, fennel, cabbage, summer squash, green beans, garlic, tofu, Brussel sprouts, oranges, asparagus and crimini mushrooms.
Chromium	90% of diets deficient	Anxiety, fatigue, glucose intolerance, adult-onset diabetes	romaine lettuce, onions, tomatoes, brewer's yeast, oysters, liver, whole grains, bran cereals, and potatoes
Copper	75% of diets deficient; average diet contains 50% of RDA*	Anemia, arterial damage, depression, diarrhea, fatigue, fragile bones, hair loss, hyperthyroidism, weakness	calf's liver, crimini mushrooms, turnip greens, molasses, chard, spinach, sesame seeds, mustard greens, kale, summer squash, asparagus, eggplant, and cashews, peppermint, tomatoes, sunflower seeds, ginger, green beans, potato, and tempeh
Omega 3 Fatty Acids	Very common	Diarrhea, dry skin and hair, hair loss, immune impairment, infertility, poor wound healing, premenstrual syndrome, acne, eczema, gall stones, liver degeneration	Salmon, flax seeds and walnuts, scallops, cauliflower, cabbage, cloves and mustard seeds, halibut, shrimp, cod, tuna, soybeans, tofu, kale, collard greens, and Brussels sprouts.
Folic acid	Average diet contains 60% of RDA*; deficient in 100% of elderly in one study; deficient in 48% of adolescent girls; requirement doubles in pregnancy	Anemia, apathy, diarrhea, fatigue, headaches, insomnia, loss of appetite, neural tube defects in fetus, paranoia, shortness of breath, weakness	romaine lettuce, spinach, asparagus, turnip greens, mustard greens, calf's liver, parsley, collard greens, broccoli, cauliflower, beets, and lentils, squash, black beans, pinto beans, garbanzo beans, papaya and string beans.
Iodine	Uncommon since the supplementation of salt with iodine	Cretinism, fatigue, hypothyroidism, weight gain	Sea vegetables, Yogurt, cow's milk, eggs, strawberries, mozzarella cheese
Iron	Most common mineral deficiency	Anemia, brittle nails, confusion, constipation, depression, dizziness, fatigue, headaches, inflamed tongue, mouth lesions	chard, spinach, thyme, turmeric, romaine lettuce, blackstrap molasses, tofu, mustard greens, turnip greens, string beans, shiitake mushrooms, beef tenderloin, lentils, Brussel sprouts, asparagus, venison, garbanzo beans, broccoli, leeks, kelp

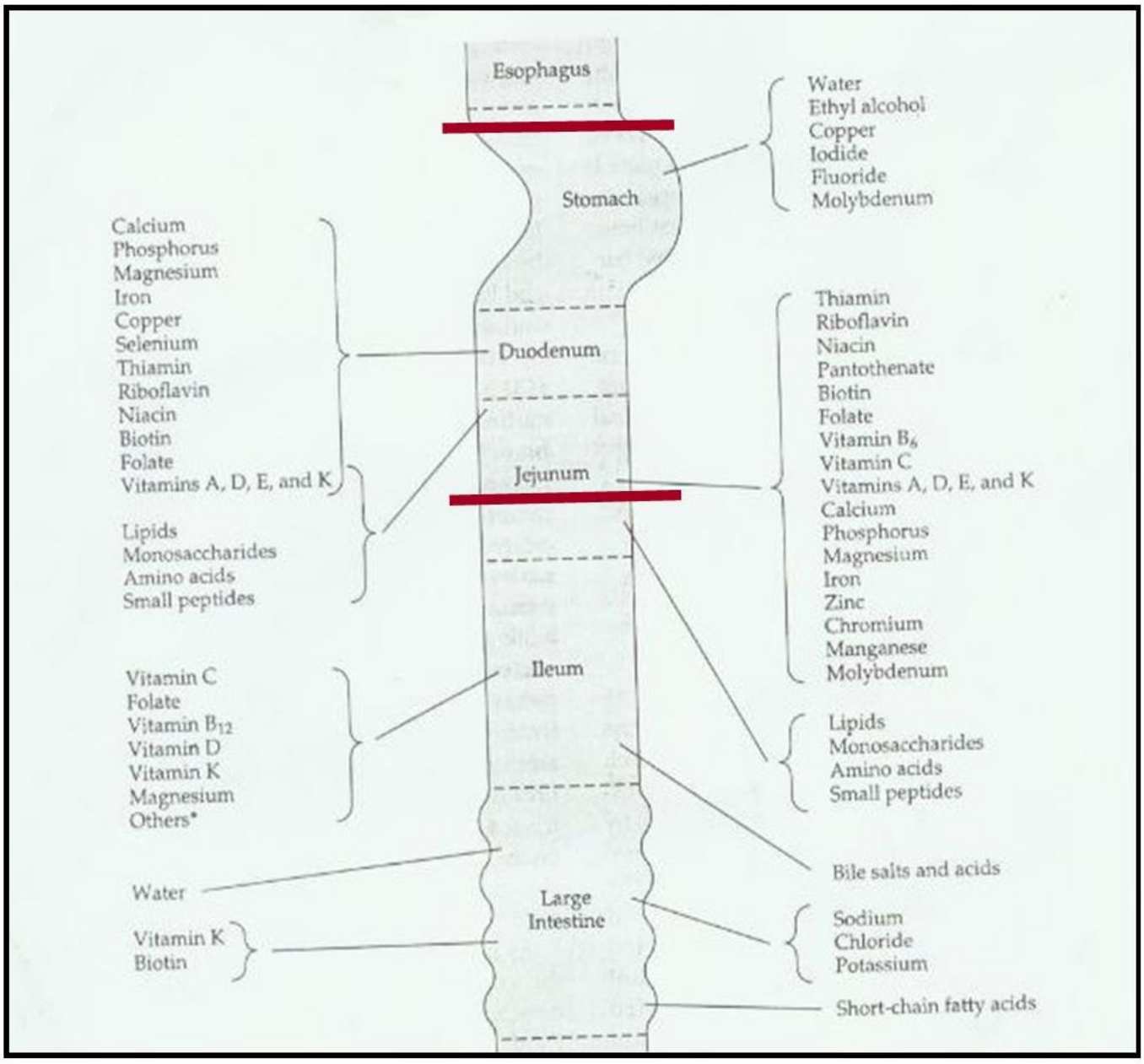
Nutrient	Incidence of Deficiency	Typical Symptoms and Diseases	Natural Sources of Nutrient
Magnesium	75 to 85% of diets deficient: average diet contains 50 to 60% of RDA*	Anxiety, confusion, heart attack, hyperactivity, insomnia, nervousness, muscular irritability, restlessness, weakness	Swiss chard, spinach, mustard greens, summer squash, broccoli, blackstrap molasses, halibut, turnip greens, pumpkin seeds, peppermint, cucumber, green beans, celery, kale and a variety of seeds, including sunflower seeds, sesame seeds, flax seeds
Manganese	Unknown, may be common in women	Atherosclerosis, dizziness, elevated cholesterol, glucose intolerance, hearing loss, loss of muscle control, ringing in ears	mustard greens, kale, chard, raspberries, pineapple, romaine lettuce, spinach, collard greens, turnip greens, kale, maple syrup, molasses, garlic, grapes, summer squash, strawberries, oats, spelt, green beans, brown rice, garbonzo beans, ground cloves, cinnamon, thyme, peppermint, turmeric, leeks, tofu, broccoli, beets, beets, whole wheat, tempeh, cucumber, peanuts, millet, barley, figs, bananas, kiwifruit, carrots black beans
Niacin (B3)	Commonly deficient in elderly	Bad breath, canker sores, confusion, depression, dermatitis, diarrhea, emotional instability, fatigue, irritability, loss of appetite, memory impairment, muscle weakness, nausea, skin eruptions and inflammation	mushrooms, tuna, beef liver, halibut, asparagus, sea vegetables, venison, chicken, salmon
Pantothenic acid (B5)	Average elderly diet contains 60% of RDA*	Abdominal pains, burning feet, depression, eczema, fatigue, hair loss, immune impairment, insomnia, irritability, low blood pressure, muscle spasms, nausea, poor coordination	Mushrooms, cauliflower, broccoli, calf's liver, turnip greens, sunflower seeds, tomato, strawberries, yogurt, eggs, winter squash, collard greens, chard and corn.
Potassium	Commonly deficient in elderly	Acne, constipation, depression, edema, excessive water consumption, fatigue, glucose intolerance, high cholesterol levels, insomnia, mental impairment, muscle weakness, nervousness, poor reflexes	chard, crimini mushrooms, spinach, fennel, kale, mustard greens, Brussel sprouts, broccoli, winter squash, blackstrap molasses, eggplant, cantaloupe, tomatoes, parsley, cucumber, bell pepper, turmeric, apricots, ginger root, strawberries, avocado, banana, tuna, halibut, cauliflower cabbage.
Pyridoxine (B6)	71% of male and 90% of female diets deficient	Acne, anemia, arthritis, eye inflammation, depression, dizziness, facial oiliness, fatigue, impaired wound healing, irritability, loss of appetite, loss of hair, mouth lesions, nausea	spinach, bell peppers, turnip greens, garlic, tuna, cauliflower, mustard greens, banana, celery, cabbage, crimini mushrooms, asparagus, broccoli, kale, collard greens, Brussels sprouts, cod, chard

Nutrient	Incidence of Deficiency	Typical Symptoms and Diseases	Natural Sources of Nutrient
Riboflavin (B2)	Deficient in 30% of elderly Britons	Blurred vision, cataracts, depression, dermatitis, dizziness, hair loss, inflamed eyes, mouth lesions, nervousness, neurological symptoms (numbness, loss of sensation, "electric shock" sensations), seizures. sensitivity to light, sleepiness, weakness	mushrooms, calf liver, spinach, romaine lettuce, asparagus, chard, mustard greens, broccoli, collard greens venison, turnip greens, chicken eggs, yogurt, cow's milk
Selenium	Average diet contains 50% of RDA	Growth impairment, high cholesterol levels, increased incidence of cancer, pancreatic insufficiency (inability to secrete adequate amounts of digestive enzymes), immune impairment, liver impairment, male sterility	Brazil nuts, button mushrooms, shiitake mushrooms, cod, shrimp, snapper, tuna, halibut, calf's liver, salmon, chicken's eggs, lamb, barley, sunflower seeds, turkey, mustard seeds, oats
Thiamin (B1)	Commonly deficient in elderly	Confusion, constipation, digestive problems, irritability, loss of appetite, memory loss, nervousness, numbness of hands and feet, pain sensitivity, poor coordination, weakness	asparagus, romaine lettuce, mushrooms, spinach, sunflower seeds, tuna, green peas, tomatoes, eggplant and Brussels sprouts.
Vitamin A	20% of diets deficient	Acne, dry hair, fatigue, growth impairment, insomnia, hyperkeratosis (thickening and roughness of skin), immune impairment, night blindness, weight loss	Calf liver, Cow's milk, eggs, carrots, sweet potatoes, spinach, kale, collard greens, and tomatoes
Vitamin B-12	Serum levels low in 25% of hospital patients	Anemia, constipation, depression, dizziness, fatigue, intestinal disturbances, headaches, irritability, loss of vibration sensation, low stomach acid, mental disturbances, moodiness, mouth lesions, numbness, spinal cord degeneration	Snapper, calf's liver, venison, shrimp, scallops, salmon, and beef. Plant sources are less consistently good sources of B-12: sea plants (like kelp), algaes (like blue-green algae), yeasts (like brewer's yeast), and fermented plant foods (like tempeh, miso, or tofu)
Vitamin C	20 to 50% of diets deficient	Bleeding gums, depression, easy bruising, impaired wound healing, irritability, joint pains, loose teeth, malaise, tiredness.	broccoli, bell peppers, kale, cauliflower, strawberries, lemons, mustard and turnip greens, brussels sprouts, papaya, chard, cabbage, spinach, kiwifruit, snow peas, cantaloupe, oranges, grapefruit, limes, tomatoes, zucchini, raspberries, asparagus, celery, pineapples, lettuce, watermelon, fennel, peppermint and parsley.
Vitamin D	62% of elderly women's diets deficient	Burning sensation in mouth, diarrhea, insomnia, myopia, nervousness, osteomalacia, osteoporosis, rickets, scalp sweating	salmon, shrimp, vitamin-D fortified milk, cod, eggs
Vitamin E	23% of male and 15% of female diets deficient	Gait disturbances, poor reflexes, loss of position sense, loss of vibration sense, shortened red blood cell life	mustard greens, turnip greens, chard, sunflower seeds, almonds, spinach, collard greens, parsley, kale, papaya, olives, bell pepper, brussels sprouts, kiwifruit, tomato, blueberries, broccoli

Nutrient	Incidence of Deficiency	Typical Symptoms and Diseases	Natural Sources of Nutrient
Vitamin K	Deficiency in pregnant women and newborns common	Bleeding disorders	spinach, Brussels sprouts, Swiss chard, green beans, asparagus, broccoli, kale, mustard greens, green peas, carrots.
Zinc	68% of diets deficient	Acne, amnesia, apathy, brittle nails, delayed sexual maturity, depression, diarrhea, eczema, fatigue, growth impairment, hair loss, high cholesterol levels, immune impairment, impotence, irritability, lethargy, loss of appetite, loss of sense of taste, low stomach acid, male infertility, memory impairment, night blindness, paranoia, white spots on nails, wound healing impairment	Calf's liver, crimini mushrooms, spinach, sea vegetables, basil, thyme, spinach, pumpkin seeds, yeast, beef, lamb, beef, lamb, summer squash, asparagus, venison, chard, collard greens, miso, shrimp, maple syrup, broccoli, peas, yogurt, pumpkin seeds, sesame seeds, mustard greens.

Where are Nutrients Absorbed?

Area between lines indicate bypassed portion of digestive system after Rouex-en-Y Gastric Bypass



(This diagram represents a typical bypass amount of 150cm.)

Which Vitamins, When?

(From Pam Tremble's OH Profile)

Here are the basic interaction rules when figuring out when to take your vitamins:

With food or without? -- In general vitamins and supplements are best taken with a meal or snack because the molecules can bind with food and be better absorbed in the body. The only exception to this rule is iron – iron likes an empty, acid tummy, so take it at least 1 hour before or after a meal.

Calcium and Vitamin D are Friends --- take them together, they help each other absorb better. Your body can only deal with 500mg at a time, so split up your doses into 3 or 4 doses per day to reach your 1500-2000mg daily goal. Calcium tends to absorb better when taken with a meal, so schedule it that way if you can.

Iron and Vitamin C are Friends --- Iron needs an acid environment to break down and Vitamin C does that job so make sure they are in your tummy at the same time. Iron does not like food, so take it on an empty stomach. However, if you get an upset tummy because of the iron, pick a non-dairy snack.

Iron and Calcium are Enemies --- iron and calcium fight for the same cell receptors in the body and calcium is "bigger and badder" and always wins. Which means the iron is simply excreted in feces and not used at all. Keep iron and calcium at least 2 hours apart from each other.

Vitamin B's are a Family --- they work together as a team and are best taken at the same time. Your Multi-Vitamin has many B's in it, so take it together with your biotin, B12, B-50 Complex and any other individual B's you might be taking.

Some foods and drugs interfere with vitamin absorption. Here are some basic guidelines:

	Calcium	**Iron**
Aids in Absorption	• Vitamin D does not need to be in tummy at same time, but serum levels should be within normal range for best utilization of calcium • Magnesium - 2:1 ratio to calcium (ie: 2000mg calcium to 1000mg magnesium, based on your body's tolerance) • Lactose	• Vitamin C or other acid-creating agent (i.e.: orange juice)
Hinders Absorption	• Iron – food or supplements • High fiber diet • Tannins (in tea and coffee) • Caffeine (over 400mg/day) • Excess Phosphoric Acid (contained in soda, bottled tea and some flavored waters) Ratio should be 1:1 • Excess soy intake (contains high phosphorus)	• Calcium – food or supplement over 300mg • Tannins (in tea and coffee) • Caffeine • Phytates (found in beans) • High fiber diet

Calcium Citrate vs. Calcium Carbonate

(From Pam Tremble's OH Profile)

After RNY our pouch no longer produces gastric acid (scientifically known as hydrochloric acid). And after surgery most surgeons have their patients take a proton pump inhibitor for several weeks/months after surgery to "kill of" any remaining acid producing cells that might cause ulcers. I took Prevacid for 12 months post-op.

The diagnosis for lack of gastric acid in a patient's stomach is called Achlorhydria. This disorder is often seen in elderly patients, but since WLS has become increasingly popular, doctors have recognized that RNY patients need the same alternative treatment as elderly patients who have the same diagnosis.

Calcium carbonate requires gastric acid in order to break down and be used by the body. It does not break down in a neutral pH environment -- meaning it is not water soluble, it requires a highly acid environment to be bioavailable.

Calcium citrate is water soluble and dissolves quickly and easily in a neutral pH environment. No acid is required. In fact, a calcium citrate supplement tablet will dissolve in plain water in about 5 to 7 minutes.

In 1985, R. R. Recker published a study in the New England Journal of Medicine that showed the absorption rates of calcium carbonate vs. calcium citrate in patients with normal stomach acid vs. patients with achlorhydria. Patients with achlorhydria absorbed calcium carbonate at a rate of 4% and absorbed calcium citrate at a rate of 45%. Patients with normal hydrochloric acid levels absorbed calcium (either type) at about the same rate with no significant difference in absorption. Calcium citrate is also recommended by the American Society of Metabolic and Bariatric Surgeons (ASMBS) due to proven absorption rates in the post-op pouch.

So what does all this mean?

It means that after RNY we must use **calcium citrate** as our calcium supplementation. Calcium carbonate does not dissolve and is not used by our body after WLS. The ASMBS Guidelines for Bariatric Nutrition recommends we take 1500-2000mg of calcium citrate supplement per day in addition to whatever calcium we get from food (1500mg for gastric band patients). It is common knowledge among the medical community that doses of calcium must be no larger than 500-600 mg at a time, spaced at least 2 hours apart.

Tums, Viactiv, Caltrate and the generic versions of all these brands.....are calcium carbonate. Stay away from them. Look for Citracal, Bariatric Advantage, UpCalD, TwinLabs Calcium Citrate and others that are calcium citrate. Read the label carefully not only for the type of calcium, but also for the serving size. Many calcium citrate brands require 2 pills per dose, so do the math according to your daily requirements. For instance, Citracal Petites have 200mg calcium per pill... so to get 2000mg of calcium per day you'll need 10 pills in 4-5 doses throughout the day.

My mom had RNY 5.5 years ago. She was never taught the difference between calcium carbonate and calcium citrate. She was simply told to "take calcium" -- not even told a certain amount per day, just to take the supplement. She took calcium carbonate since it was cheaper and easier to find – when she remembered to take it at all. This past year she was diagnosed with osteoporosis with an **18.1% bone density loss in her spine**. She is only 54 years old and faces a very difficult road ahead with brittle bones, fractures and dental problems. I preach about calcium so passionately because I don't want any other WLS patient to be faced with the same fate.

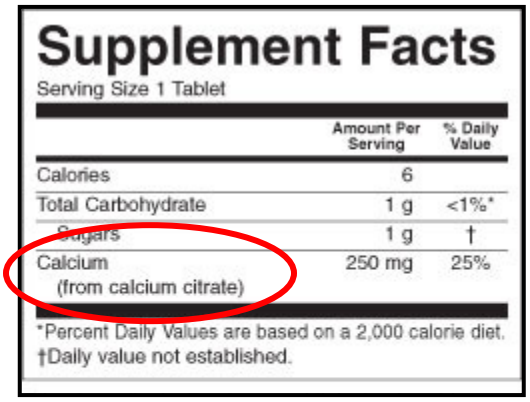
Types of Calcium

Supplement Type	Elemental Calcium by Weight	Comments
Calcium Carbonate	40%	• Most commonly used • Less well absorbed in persons with decreased stomach acid (e.g., elderly or those on anti-acid medication or gastric bypass surgery) • Natural preparations from oyster shell or bone meal may contain contaminants such as lead • Least expensive
Calcium Citrate	21%	• Better absorbed, especially by those with decreased stomach acid • May protect against kidney stones • More expensive
Calcium Phosphate	38% or 31%	• Tricalcium or dicalcium phosphate • Used more in Europe • Absorption similar to calcium carbonate
Calcium Gluconate	9%	• Used intravenously for severe hypocalcaemia • Well absorbed orally, but low content of elemental calcium • Very expensive
Calcium Glubionate	6.5%	• Available as syrup for children • Low content elemental calcium
Calcium Lactate	13%	• Well absorbed • Low content elemental calcium
SOURCE: Gregory, Philip J. (2000) "Calcium Salts." *Prescriber's Letter*. Document #160313		

Understanding Calcium Citrate Labeling

500 mg Calcium AS Citrate = contains 500mg elemental calcium
500 mg Calcium FROM Citrate = contains 500mg elemental calcium
500 mg Calcium Citrate = contains 21% elemental calcium = 105mg
500 mg Calcium = it's probably calcium carbonate, but who knows for sure! If it isn't properly labeled, don't buy it.

READ THE LABEL & DO THE MATH
Make sure you read the label to determine serving size of a full dose. Then do the math to determine how many tablets you need per day to reach your total calcium goal.



Why your serum calcium lab results mean nothing

99% of the calcium in your body is contained in bones, teeth and cell tissue.
1% of your calcium is contained in your blood.

When you have blood drawn for labwork, only 1% of your total body calcium is being tested. The body needs a perfect calcium level in the blood in order to control essential functions of the body including cell growth; blood clothing; organ, nerve and muscle function. Basically, the body is going to do whatever it has to do to keep the blood calcium level perfect in order to keep your heart beating and to keep you alive.

When your blood calcium level is just slightly off, your body sends a distress signal to the parathyroid that it needs more calcium. The parathyroid will signal to your body to release calcium from your bones and teeth to get the blood calcium level back in line immediately. Therefore, your labwork will always show that your calcium levels are "perfect."

Because of its biological importance, calcium levels are carefully controlled in various compartments of the body. **The three major regulators of blood calcium** are parathyroid hormone (PTH), vitamin D, and calcitonin. PTH is normally released by the four parathyroid glands in the neck in response to low calcium levels in the bloodstream (hypocalcemia). PTH acts in three main ways: (1) It causes the gastrointestinal tract to increase calcium absorption from food, (2) it causes the bones to release some of their calcium stores, and (3) it causes the kidneys to excrete more phosphorous, which indirectly raises calcium levels.

Vitamin D works together with PTH on the bone and kidney and is necessary for intestinal absorption of calcium. Vitamin D can either be obtained from the diet or produced in the skin when it is exposed to sunlight or taken as a dietary supplement. Calcitonin, a hormone released by the thyroid, parathyroid, and thymus glands, lowers blood levels by promoting the deposition of calcium into bone.

Most dietary calcium is absorbed in the small intestine and transported in the bloodstream bound to albumin, a simple protein. Because of this method of transport, levels of albumin can also influence blood calcium measurements.

How do you know if your body is leaching calcium from your bones and teeth?

If your lab results show a chronic combination of the following, your body is stealing calcium stores from your bones and teeth:

Calcium Levels = within normal range
Vitamin D (D25hydroxy) = low or deficient
PTH (parathyroid) = high

Source: http://www.faqs.org/nutrition/Ca-De/Calcium.html

Why is Vitamin D so Important?

Vitamin D is the gatekeeper of calcium in the body. As long as there is a healthy level Vitamin D in the body calcium is able to work properly. If you are deficient in Vitamin D, then the body will signal to the parathyroid gland that you aren't able to properly absorb calcium and it will begin to pull calcium stores from your bones and teeth.

There are two main types of Vitamin D. Ergosterol is the basic building block of vitamin D in plants. Cholesterol is the basic building block of vitamin D in humans. Although the body is able to use either form of Vitamin D, it is easier for the body to utilize and store Vitamin D3.

VITAMIN D2 - When ultraviolet light from the sun hits the leaf of a plant, ergosterol is converted into ergocalciferol.

VITAMIN D3 - When ultraviolet light hits the cells of our skin, one form of cholesterol found in our skin cells - called 7-dehydrocholesterol - can be converted into cholecalciferol, a form of vitamin D3.

Vitamin D Helps to:

- Prevent bone fractures
- Prevent falls in older people and osteoporosis
- Reduce the risk of cancer, especially colon cancer, prostate cancer, and breast cancer
- Reduce the risk of diabetes, especially in young people and in those living in high altitude
- Protect against heart disease, including high blood pressure and heart failure
- Reduce your risk for multiple sclerosis
- Improve you mood
- Improve your lung function.

If You Don't Get Enough Vitamin D

- Your bones can become weak and can break
- Children can get "rickets," a disease that prevents their bones from growing properly, delays their growth, and causes problems with their immune system
- Adults can develop "osteomalacia," a disease that weakens the bones and makes them hurt, and also causes fractures
- Older adults can get osteoporosis, which doesn't cause pain, but makes the bones thin and easy to fracture

It has been said that 85% of all Americans are Vitamin D deficient. That number is even higher in residents of northern states because of the lack of sunlight in winter months. People with dark skin (African Americans, Latinas, Asians, etc.) are more likely to be Vitamin D deficient because their skin pigmentation blocks the UVB rays needed for the body to convert sunlight into Vitamin D.

There are three main sites in the digestive tract where Vitamin D is absorbed (see diagram on page 8). After RNY two of those three sites are bypassed. Vitamin D is a fat soluble vitamin and since we malabsorb fat after RNY – the likelihood that we become Vitamin D deficiency is even greater.

Because gastric bypass patients malabsorb fats in the diet, it is important for us to use a **water soluble formulation of Vitamin D3** for the best chance of absorption. This formula is often referred to as "dry" Vitamin D3. Basically all that means is that it's not suspended in an oil-based formula. You want to look for a white tablet or a capsule filled with a white powder. Avoid gel-caps as these are oil-based formulations.

Vitamin D continued …

What is a Good Lab Result?

The lab test is called: **25-hydroxyvitamin D** test or **25(OH)D** for short. Each lab will has their own range of "normal" – but the typical standard is 30-100 ng/ml. However, new studies show that minimum levels should be 50 ng/ml or above for both adults and children. These new studies found that the body does not reliably begin storing cholecalciferol in fat and muscle tissue until 25(OH)D levels get above 50 ng/ml. The average person starts to store cholecalciferol at 40 ng/ml, but at 50 ng/ml virtually everyone begins to store it for future use. That is, at levels below 50 ng/ml, the body uses up vitamin D as fast as you can make it, or take it.

Additionally, it is being found that the reduction in cancer risks and multiple sclerosis risks are not realized until the 25(OH)D levels are maintained over the level of 80 ng/ml. (Source: The Vitamin D Council)

How Much Do We Need?

Humans make at least 10,000 units of vitamin D within 30 minutes of full body exposure to the sun, what is called a minimal erythemal dose. Vitamin D production in the skin occurs within minutes and is already maximized before your skin turns pink. HOWEVER, remember to balance your need for sunlight for Vitamin D production with the added risk of skin cancer due to being in the sun without sunscreen protection.

The current U.S. RDA for Vitamin D is 800IU/day. However, we know that the RDA is the minimum amount needed to simply keep us alive… not necessarily keep us healthy. The Vitamin D Council indicates that healthy adults who need to maintain their already ideal 25(OH)D level should take 2000IU/day. Individuals who are trying to increase their Vitamin D level should take 5,000IU/day. Current research is showing that higher doses (up to 10,000IU/day) are not causing levels of toxicity. However, you should always consult your doctor for therapeutic dosing when you are Vitamin D deficient.

Foods that Provide Vitamin D

These are good sources for Vitamin D, but remember that if you have RNY or DS, your body is not fully able to pull micronutrients from the food we eat.

FOOD	SERVING SIZE	VITAMIN D, IU
Cod liver oil	1 Tablespoon	1360
Salmon, cooked	3 1/2 ounces	360
Mackerel, cooked	3 1/2 ounces	345
Sardines, canned in oil and drained	1 3/4 ounces	250
Tuna fish, canned in oil	3 ounces	200
Milk (skim, low fat, whole), vitamin D fortified	1 cup	98
Margarine, fortified	1 Tablespoon	60
Pudding (from mix, with vitamin D-fortified milk)	1/2 cup	50
Cereal, vitamin D fortified	3/4 to 1 cup	40
Egg	1 whole	20
Liver or beef, cooked	3 1/2 ounces	15

Cheese, Swiss	1 ounce	12

Scheduling

The best way to stay on track with your vitamins is to have a very specific schedule for taking each dose of your supplements. You can't rely on "when I think about it" … you have to have a plan.

This is my current schedule.

I've now switched to an "every 2 hours" vitamin schedule because I had to add a few additional supplements based on my lab results.

I use the free online website tool at www.MyMedSchedule.com to keep track of my vitamins and medications AND it sends me automatic text-message alerts to my cell phone to remind me to take my meds throughout the day. The only drawback is MyMedSchedule only allows 6 dosage times and I need 7. What's not shown here is a dose of calcium at 7am.

This is the schedule I used for the first year after surgery.

Because vitamins are best absorbed when taken with food, the schedule below works great as a starting point for developing your own routine.

7:00 a.m.
Protein Shake -- Calcium +D

10:00 a.m.
Breakfast -- Multi-Vitamin, B-50, fish oil capsule, Colace

1:00 p.m.
Lunch -- Calcium +D

4:30 p.m.
Protein Snack -- Calcium +D

7:30 p.m.
Dinner -- Calcium +D

9:30 p.m. or 10:00 p.m.
No-food, empty stomach **--** Iron & Vitamin C

11:00 p.m.
Bedtime Snack (can be something tiny like crackers, pudding or yogurt) -- Multi-Vit, B-50, fish oil capsule, Colace, B-12

LAB TESTS

suggested for gastric bypass patients

Regularly (every 3-6 months depending on your previous results)

- **COMPREHENSIVE METABOLIC PROFILE** (sodium, potassium, chloride, glucose, BUN, creatinine, calcium, total protein, albumin, total bilirubin,alkaline phosphatase, aspartate aminotransferase) (Nc,K,C1,CO2,Glu,BUN,Cr,Ca,TP,Alb,Tbili,AP,AST,ALT)
- **LIPID PROFILE** (cholesterol, HDL, LDL, triglycerides, chol/HDL ratio) (Fasting specimen) , Tchol,Trig,HDL,Calc,,LDL)
- **ALT** (SPGT)
- **GGT** (important if liver, renal or pancreatic issues are suspected)
- **LDH**
- **PHOSPHORUS – INORGANIC**
- **URIC ACID** (to determine if a patient has gout)
- **CBC** (HEMOGRAM/PLT/DIFF)
- **B-12**
- **FOLATE**
- **HOMOCYSTEINE**
- **IRON**
- **TIBC**
- **% SAT**
- **FERRITIN**
- **VITAMIN A**
- **VITAMIN D** (25-hydroxy)
- **THYROID PANEL** (T3U, T4, FTI, TSH)
- **SERUM INTACT PTH**
- **THIAMINE (B1)**
- **COPPER**
- **ZINC**
- **MAGNESIUM RBC**
- **A1C** (only if history of diabetes)

- **DEXA SCAN** for bone density (annually at same time each year)

Possible diagnosis codes:

244.9 hypothyroidism
250.0 diabetes
265.0 Beriberi
265.1 Other and Unspecificed Manifestations of Thiamine Deficiency (B1)
266.2 cyanocobalamin deficiency (B12)
268 vitamin D deficiency
268.2 metabolic bone disease
269.2 hypovitaminosis
269.3 zinc deficiency
272.0 hypercholesterolemia
275.40 calcium deficiency
276.9 electrolyte and fluid disorders
280.9 iron-deficiency anemia
281.0 pernicious anemia
281.1 other B12 deficiency anemia
281.2 folate deficiency anemia
285.9 anemia, unspecified
401.9 hypertension
579.3 post-surgical malabsorption
579.8 intestinal malabsorption

It is recommended that you keep track of the results for each post-surgical lab draw. Get a hard copy of your lab results from your doctor and keep your own file. Record the results in this spreadsheet. By tracking your own results and seeing them side by side over time, you are able to catch any downward trends before they become deficiencies.

This MS Excel Spreadsheet file is available for download at: http://pamtremble.blogspot.com/2008/10/labwork-recommendations-after-wls.html

	Record of Lab Work	Normal Range		Vitalady Ideal Lab Recom.	Date Immediate Preop	Date 2 weeks	Date 6 weeks	Date 3 mo	Date 6 mo	Date 1 yr	Date 18 mo	Date 2 yr
	Comprehensive Met											
GLU	Glucose	70 - 110	mg/dL									
BUN	Blood Urea Nitrogen	10 - 20	mg/dL									
CREAT	Creatinine	.4 - 1.0	mg/dL									
	BUN / CREAT Ratio	6.0 - 20.0	ratio									
NA-I	Sodium	135 - 145	mEq/L									
K-I	Potassium	3.5 - 5.5	mEq/L									
CL-I	Chloride	99 - 110	mEq/L									
CO2	Carbon Dioxide	22 - 33	mmo1/L									
Ca	Calcium	8.4-10.2	mg/dL	9.0-9.4								
OSMO	OSMO Calc	274 - 295	mosm/k									
	Globulin, Calc	2.3 - 3.5	gm/dl									
BIL-D	Biliruben	0.1-0.2	mg/dl									
BIL-T	Total Biliruben	.0 - 1.5	mg/dL									
TP	Total Protein	6.1 - 7.9	g/dl	7's								
ALB	Albumin	3.4 - 4.8	g/dL	4's								
A/G	Albumin/Globulin ratio	1.0 - 2.0	ratio									
ALT	Alanine aminotransferase	19 - 60	IU/L	below 40								
AST	Aspartate aminotransferase	13 - 37	IU/L	below 40								
ALP	Alkaline phospatase	38 - 126	IU/L									
	Pre-Albumin	18-38	mg/dL	20-30's								
	Lipid											
CHOL	Cholesterol	**120-200**	**mg/dL**									
TRIG	Triglicerides	**35-160**	**mg/dL**									
HDL-D	High Density Lipoprotein	**45-99**	**mg/dL**									
LDL-D	Low Density Lipoprotein	**20-130**	**mg/dL**									
PHOS	Phosphorous	**2.7-4.5**	**mg/dL**									
Mg	Magnesium	**1.2-2.2**	**mg/dL**									
LDH	Lactic dehydrogenase	**135-225**	**IU/L**									
	IRON/IBC											
	Iron	49-167	ug/dL	80-100								
UBIC	UBIC	159-375	ug/dL									
TIBC	Total iron binding capacity	250-450	ug/dL									
	Trans Sat		%									
Fe	Fe Sat	15-55	ug/dL									
	Ferritin	30-400	ng/ML	200-300								
	B12/Folate											
	B12	246-911	pg/mL	1000+								
	Folate	4.2-19.9	ng/mL	20-Oct								
	GGT	7-50	IU/L									
	Uric Acid	2.4-7.0	mg/dL									
	T4 Thyroxine	4.6-12.0	ug/dL									
	Free T4	0.8-1.8	ng/Dl									
	T-UP% Thyroxine uptake	29.6-40.6	%u									
	FTI	1.5-5.5										
	TSH	0.35-5.50	mIU/mL									
	CBC											
WBC	White blood cells	3.4-11.0	K/CMM									
LY%	Lymphocyte %	10.0-40.0	%									
MO%	Monocytes %	1.7-9.3	%									
	Mono Absolute	.01 - 1.65	k/cmm									
GR%	Neutrophils %	42.2-75.2	%									
LY#	Lymphocytes	1.2-3.4	k/uL									
	Lumph Absolute	.34 - 4.40	k/cmm									
MO#	Monocytes	.2-15.0	k/uL									
GR#	Neutrophils	1.4-6.5	k/uL									
RBC	Red blood cells	4.0-5.50	M/uL									
HGB	Hemoglobin	11.5-16.0	g/dL	12+								
HCT	Hematocrit	32.0-45.0	%	36+								
MCH	Mean corpuscular hemogloben	26 - 34	pg									
MCHC	Mean corpuscular hemo concentration	30.5 - 36.0	gm/dl									
MCV	Mean corpuscular volumn	75 - 102	fL									
MPV	Mean Platelet Volumn	0.1-12.3	fL									
	Eosinophils	.0-10.0	%									
RDW	Red cell distribution width	11.6-16.5	%									
SEGS		44.0-85.0	%									
SEGS	SEGS Absolute	1.5-9.35	k/cmm									
PLT	Platelets	130-400	k/uL									
	Miscellaneous											
	DHEA, Serum	1.9-7.6	ng/mL									
	Cortisol, AM	4.3-22.4	mcg/dl									
	Basophils	.0-2.0	%									
	EOS Absolute	.11 - 1.10	k/cmm									
	Vitamin B1			mid to top								
	Intact PTH (Parathyroid Hormone)	15-65	pg/mL	30-40								
	Vitamin A - Serum	30-90	ug/dL	60-80								
	Vitamin D, 25 hydroxy	15-75	pg/mL	80-100								
	Vitamin B6			mid to top								
	Magnesium			mid range								
	Zinc, Serum	70-159	ug/dL	mid range								