

Valley Metabolic Program Guide

Aiming to reverse the rising tide of type 2 diabetes, fatty liver, PCOS, and complications of obesity in Nova Scotia



Terms of Use of the Valley Metabolic Guide

The Valley Metabolic Program Guide is intended for use by patients who are under the care of a clinician with competency in utilizing low carbohydrate diets for the purposes of therapeutic nutrition. The Valley Metabolic Program Guide is intended for use following an informed discussion of the risks and benefits of a low carbohydrate dietary intervention and within the context of ongoing professional medical support. Patients using this guide should receive individualized advice from their treating clinician regarding the appropriateness of following a low carbohydrate dietary approach for their specific medical condition(s). This Valley Metabolic Program Guide document is not a substitute for consultation with a healthcare professional.



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Program Overview

The Valley Metabolic Program is a medically supervised program utilizing *low carbohydrate diets* to treat metabolic disorders including type 2 diabetes mellitus, non-alcoholic fatty liver disease, polycystic ovarian syndrome, and obesity with associated complications. The Program focuses on reducing medications when possible, while optimizing other medications to lower risk of complications.

The Valley Metabolic Program is an intensive 3 month lifestyle intervention which includes group meetings on week 0, 2, 4, 8, and 12, a grocery store tour, and other activities led by professional dietitian, Becca Green-LaPierre. There is an associated Facebook page (search Valley Metabolic Program in the Facebook search bar) for ongoing peer support, as well as an alumni program to assist with long term adherence to this pattern of eating. The full program has an associated cost, but there is no cost for physician visits.

Biographies

Dr. Michael Mindrum, MD, FRCPC practices General Internal Medicine. He is the Medical Director of the Valley Metabolic Program as well as the Diabetes Centre at the Valley Regional Hospital. He is passionate about improving the quality of the lives of patients with diabetes. He graduated from the University of Louisville School of Medicine and completed his residency training at the University of Hawaii, The University of Vermont, and Dalhousie University. He married Dr. Christa Mindrum, a family physician and Newfoundlander, which led to his migration north to Nova Scotia. He is thrilled that this program has come to fruition.

Dr. Christa Mindrum, MD, CCFP is a locum family physician practicing in the Annapolis Valley. She is an advocate for patient-centred care and enjoys both the art and science of medicine. She graduated from Memorial University Medical School in 2003 and Memorial's Family Medicine Residency Program in 2005. Christa and Michael moved to Nova Scotia in 2010 and have 3 small children, 1 giant dog, 1 bearded dragon and 16 fish (give or take a few). Christa is excited to support participants in this exciting journey toward self-empowerment and greater health.

Becca Green-LaPierre, MSc, Pdt is a wife, mom and professional dietitian. She obtained her undergraduate degree from the University of Guelph, and her master's degree from Mount Saint Vincent University in Halifax. She's worked in Ontario in a variety of interprofessional health clinics and volunteered extensively with both school aged children and pregnant moms, helping increase their nutrition and cooking skills. She moved to the beautiful Annapolis Valley two years ago and is thrilled to have been part of the Valley Metabolic Program team since its inception.

Dr. Joelle Caplan, PhD is a clinical psychologist currently in private practice in New Minas. She was previously a practicing therapist and coordinator of mental health services for Kings County. She also has Diabetes (Type 2) and has embraced the LCHF way of eating since January 2017. Quite simply, it has changed her life! Because of her belief in this evidenced based dietary treatment and the fact that her own experience has demonstrated the health benefits of LCHF way of eating, Joelle is excited to offer support as part of the Metabolic Program Team.

Type 2 Diabetes, Fatty Liver, PCOS, and Obesity

Let's first briefly introduce conditions that this Program can help address:

Type 2 Diabetes (T2D) is defined by elevated blood glucose and differs from Type 1 DM in that the pancreas is still able to produce insulin. T2D typically presents in adulthood and is a combination of the body not listening to insulin (insulin resistance) followed by the pancreas not making enough insulin to overcome this insulin resistance. The combination of high glucose and inflammation seen in T2D can lead to complications of the large arteries of the brain and heart, or small arteries of the eyes, kidney, and nerves.

Non-Alcoholic Fatty Liver Disease (NAFLD) is defined by excess fat in the liver. NAFLD can lead to inflammation and cirrhosis (scarring of the liver). NAFLD is a risk factor for coronary artery disease, T2D, and other health complications.

Polycystic Ovarian Syndrome (PCOS) is the most common cause of infertility in women due to shifts in hormone production leading to lack of ovulation. It is associated with obesity, elevated insulin, and insulin resistance. Patients with PCOS are at higher risk of developing T2D and possibly heart disease.

Obesity is defined as a higher than normal level of adiposity (fat). Some people living with obesity may have excellent fitness, function, quality of life, and metabolic parameters so obesity itself may not be a problem outside of the stigma and bias society has created. For many individuals though, obesity is associated with increased risk of T2D, NAFLD, PCOS, osteoarthritis, sleep apnea, and several types of cancer.

Low Carbohydrate Diets and Why They Work

The type of low carbohydrate diet the Valley Metabolic Program endorses is a balance of whole, real, and satisfying foods with low amounts of sugars and starches (fibre is not restricted), moderate intake of protein, and a relatively high intake of healthy dietary fat. This way of eating is referred to as “Low Carb, High Fat” (LCHF).

LCHF diets can be classified as **ketogenic**, **moderate**, or **liberal**. When carbohydrates are restricted to less than **20 grams** per day it is considered ketogenic. Moderate low carbohydrate diets are typically defined by intake of **20-50 grams** of carbohydrates per day, and liberal low carbohydrate as less than **100 grams** per day.

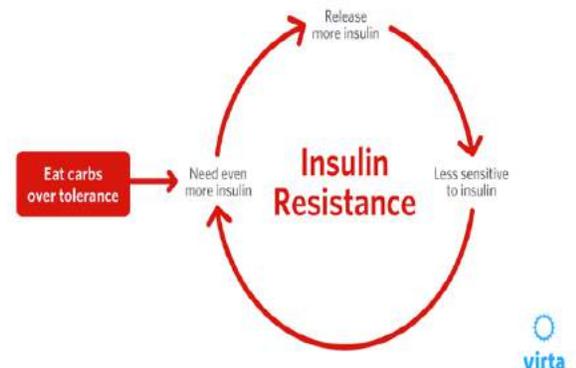


graphic courtesy www.dietdoctor.com

The degree of carbohydrate restriction recommended will be dependent on your medical condition as well as your personal preferences to allow for long term adherence to this pattern of eating. **Typically, the lower the carbohydrate intake the more effective it is at improving metabolic disease.**

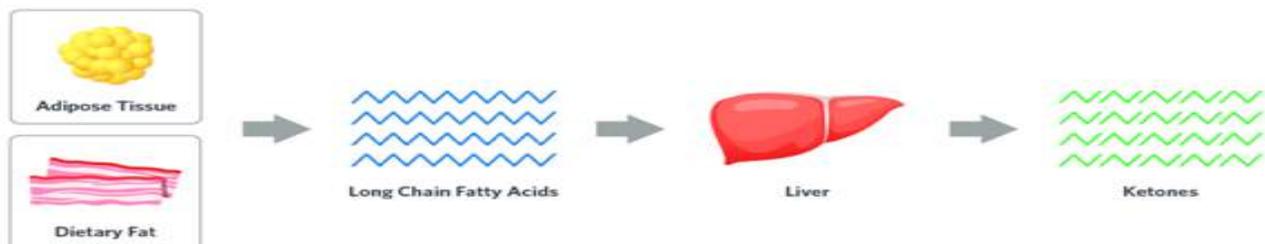
The typical North American diet is composed of around 300 grams of carbohydrates a day which provides up to half of our daily caloric intake. Most carbohydrates (think bread, fruit, pasta) are composed mainly of sugar and starch which both rapidly break down into glucose in our blood stream. When eating carbohydrates at this amount the body’s cells are primed to use glucose as fuel for energy.

To keep blood glucose at a safe and healthy level, the body’s pancreas produces the hormone insulin. One of insulin’s main jobs is moving glucose from from the blood into our cells. T2D, NAFLD, PCOS and obesity all share a common theme of elevated levels of insulin and high insulin resistance. When insulin resistance occurs, blood glucose levels increase above normal. In response to the high blood glucose levels and insulin resistance, the pancreas makes more insulin leading to a cycle of higher insulin and higher insulin resistance. Given that carbohydrates are the main cause of insulin “spikes” after eating a meal, these metabolic conditions can all be considered conditions of “carbohydrate intolerance”.



graphic courtesy www.virtahealth.com

LCHF diets restrict dietary sugars and starches which leads to a decrease in blood sugars and this in turn lowers insulin requirements. As dietary carbohydrates are restricted and insulin levels fall, the body's cells need a new source of fuel for energy: enter our fat stores! On a LCHF diet, triglycerides (the storage form of fat) are mobilized from our adipose tissue and travel to the liver where they are broken down into **ketones**.



graphic courtesy www.virtahealth.com



Most of the cells in our body can effectively and efficiently use ketones for energy. A LCHF diet allows us to access our own fat stores for energy. Over time this leads to a natural reduction in hunger and caloric intake. As you continue this way of eating the machinery inside your cells become better and better at utilizing fat and ketones for energy. This process is called **fat adaptation**. At this point, you can become a “fat burning machine”!

On a LCHF diet you do not need to count calories and you do not need to fight hunger. You may consume as much food as you need to feel satisfied as long as your dietary carbohydrates intake is restricted to the level recommended by the Program doctor.

For patients with T2DM and pre-DM, ketogenic diets (<20 grams carbs per day) have been shown to improve blood sugar while reducing or eliminating medications. In some circumstances, diabetes can be placed in remission!

This Program will guide your exploration of a new way of eating. Please note, it is important to understand that there are different clinical responses to LCHF diets that vary from one person to the next. This is due to differences in genetics, factors such as the duration of diabetes, the amount of insulin that your pancreas is able to produce, the degree and duration of your insulin resistance, and other life factors. As with any “intervention” adherence is key.

How to Follow a LCHF Diet

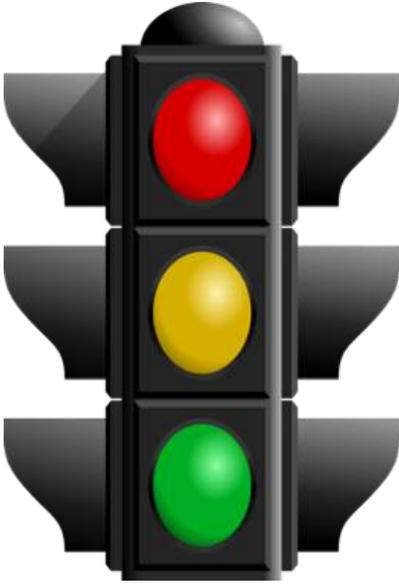
The LCHF way of eating is significantly different from the typical Canadian diet! To start, it is important to know there are three main macronutrients: carbohydrates, protein and fat. The table below briefly lists some common foods which are predominantly composed of one macronutrient. Your daily consumption of each macronutrient will depend on the recommendation from our Program doctor, your health status, activity level and personal health goals.

Macronutrients and LCHF

Carbohydrates are found in juices, sodas, smoothies, fruits, grains, rice, breads, pastas, cereals, processed foods, and starchy vegetables (such as those that grow below the ground, like potatoes). Sugar and starches contain chains of linked glucose (sugar) molecules that are released in the bloodstream as glucose. Carbohydrates, more than any other macronutrient, requires increased amounts of insulin to move glucose from the bloodstream into the cells of our body. This macronutrient is restricted on a LCHF diet in order to improve our blood glucose, lower the need for insulin, and shift our metabolism to burning fat instead of glucose.

Proteins are found in meat, fish, eggs, nuts, seeds, and dairy. We need to eat a moderate amount of protein every day to maintain our muscle mass. Those following a liberal LCHF diet can include beans and legumes while tracking carbohydrate intake while those following a ketogenic diet will typically avoid them.

Fats are found in high fat dairy products, eggs, nuts, seeds, meat, avocados, olives, butter, and oils. Oils such as olive oil and coconut oil are preferred over other vegetable oils. When the body has learned to burn fat for fuel, dietary fats become a very healthy source of energy. During weight loss we burn internal fat stores and caloric intake naturally decreases. As we approach our maintenance weight on a LCHF diet our caloric intake increases and we thus need to significantly increase the amount of dietary fat to aid us in feeling full.



The **Valley Metabolic Program** has adapted the Lifestyle Medicine Clinic at Duke University’s “food list” with Dr. Eric Westman’s permission. If food is on the list you can eat it. If food is not on the list then we recommend you avoid it; however, we appreciate the list may not be exhaustive so during the Program we learn how to read food labels and discover carbohydrate contents of foods.

This Guide also presents a possible grocery shopping list, a sample two day menu and some breakfast, lunch and snack ideas. These tools are meant to help you have a good start and provide an initial reference as you explore other resources along your journey.

The Guide is designed to support those wishing to follow a very low carbohydrate/ketogenic diet. For those wishing to follow a moderate or liberal low carbohydrate diet please adapt the Guide to your need as you will be able to eat more starchy vegetables, some whole grains, beans, legumes, and lentils.

**“Live the healthiest lives you can enjoy,
not the healthiest lives you can tolerate.”**

~ Yoni Freedhoff, MD, Bariatric Medicine Specialist

Foods to Enjoy

Salad Greens	<p style="text-align: center;">Such as spinach, lettuces of all types, and kale. Other greens include arugula, bok choy, chard, chives, endive, fiddleheads, beet greens, parsley, radicchio, radish tops, seaweed, scallions and watercress.</p> <p style="text-align: center;"><i>Aim to eat at least 2 cups/day of salad greens.</i></p>
Fibrous Vegetables	<p style="text-align: center;">Such as artichokes, asparagus, broccoli, Brussel sprouts, bean sprouts, cauliflower, celery, cucumber, eggplant, green & yellow beans, mushrooms, onions, peppers, rhubarb, snow peas, sugar snap peas, tomatoes, turnip, and zucchini.</p> <p style="text-align: center;">Vegetables do contain some carbs; a general rule of thumb is that veggies that grow underground (think potatoes) contain more carbs than those that grow above ground... of course corn does not follow the rules and is high in carbs.</p>
Meat	<p style="text-align: center;">including beef, pork, lamb, chicken, turkey, duck, or any fowl can be enjoyed.</p> <p style="text-align: center;">There is no need to trim fat or remove skin if you so choose.</p>
Fish and Seafood	<p style="text-align: center;">such as tuna, shrimp, scallops, crab, and lobster. We encourage omega 3 rich fatty fish such as salmon, sardines, mackerel, trout, and herring.</p>
Eggs	<p style="text-align: center;">can be enjoyed as much as you like!</p>
Edamame and Tofu	<p style="text-align: center;">Edamame are soybeans, a good source of protein and fibre. Tofu is a low carb meat alternative made from soybeans. Also unsweetened fortified soy beverage is a fine alternative to cow's milk.</p>
Healthy Fats	<p style="text-align: center;">such as olive oil, butter, ghee, coconut oil, avocado oil, and walnut oil.</p>
Plain Yogurt	<p style="text-align: center;">Plain yogurt has naturally occurring sugars in it, so be mindful of the serving size! Generally Greek yogurt has less carbs/per serving and is a good source of protein.</p>

Foods to Enjoy in Moderation

Aim for <2 grams of carbohydrates per serving for dairy and processed meats.

Aim for <5 grams of carbohydrates per serving for vegetables.

Cheese	up to 4 ounces per day (1 oz of cheese is about the size as a pair of playing dice).
Cream	up to 4 tablespoons a day of light or full fat sour cream.
Avocado and Olives	½ avocado/day & up to 6 green or black olives a day.
Berries	up to 1 cup per day of blueberries, strawberries, raspberries, and haskap berries.
Squashes	up to 1 cup a day of butternut, acorn, pumpkin, spaghetti
Nuts and Seeds	Limit to ¼ cup a day. Avoid cashews and pistachios. Consider unsweetened fortified nut beverages such as almond milk to replace cow's milk
Condiments	often contain added sugars so read the label! Generally, soy sauce, mustard, mayonnaise, lemon juice, lime juice, dill pickles and salsa are fine.
Dark Chocolate	look at serving size and carbohydrate content. You should aim for at least 85% cocoa: the higher the cocoa content means more fibre and less added sugar.
Alcohol	avoid first 2-4 weeks while starting a keto diet and afterward enjoy one drink of liquor or dry red or dry white wine occasionally. Avoid iced wines, coolers, alcohol mixes that contain sugar, and most beer (see next page).
Sweeteners	such as Stevia, Erythritol, and Xylitol are felt to be generally safe. Ideally sweeteners should be minimized but can be a helpful tool as you shift to a natural whole foods diet.
Processed Meats	such as bacon, sausage, pepperoni, and hot dogs should be consumed in moderation. Try to limit types of meat made with nitrates and make sure you read labels to assess the carbohydrate content (see recommendation above).

Foods to Restrict

Avoiding these foods rich in sugar and starches will help you eat less than 20 grams carbohydrates/day.

Sugars	<p>have many names! Watch for these words on food labels: white sugar, brown sugar, cane sugar, honey, maple syrup, molasses, corn syrup, brown rice syrup, agave syrup, glucose, fructose, sucrose, malt. You want to avoid foods with added sugars. If you see it in the ingredient listing, it's been added.</p>
Grains	<p>such as wheat, oats, rice, cornmeal, rye, amaranth, spelt, and all the typical foods made with grains including bread, pasta, cereals, pita, tortilla, crackers, muffins, cookies, donuts and cookies.</p>
Fruits	<p>and especially fruit juices are avoided. Tropical fruit like bananas, mangoes, and pineapple are very high in sugar content. Later in the diet small amounts of pear and apple may be tolerated. Of note, berries ARE allowed in moderation.</p>
Starchy Vegetables	<p>are ones that typically grow below the ground including potatoes, sweet potatoes, carrots, and parsnips. Corn is also high in carbs.</p>
Pulses	<p>such as chickpeas, lentils, pinto beans, lima beans, black beans, and kidney beans. While rich in fibre and protein, they are high in carbohydrates. Certain bean dips (e.g. hummus) may be enjoyed in moderation, keeping an eye on total daily carbohydrate intake.</p>
Milk	<p>Cow's milk should be avoided as it is rich in sugar. Check food label for carbohydrate content of milk alternatives, choose unsweetened versions.</p>
Flavoured Yogurt	<p>Don't be fooled, flavoured yogurts are heavily sweetened!</p>
Beer	<p>except ultra low carb beers such as Sleeman'2.0 or Michelob Ultra</p>

LCHF Menu Planning (with a ketogenic focus)

Often we find that people struggle with making breakfast, lunch and snacks the most because the typical Canadian diet involves eating cereal, sandwiches and high carb snacks at these times. Here are some quick and easy ideas to get you started:

Breakfast Ideas

1. Full fat plain yogurt, ½ cup mixed berries, ⅓ cup nuts & seeds
2. Quiche (without the crust!)
3. Eggs - scrambled, over easy, sunny side up... any way you like them!
4. Coconut milk based smoothie with spinach, berries and ground flax seed

Lunch Ideas

1. Lettuce leaf sandwiches (tuna salad, egg salad, or deli meats with cheese, mustard, mayo, wrapped in romaine or iceberg lettuce)
2. Hamburger (hold the bun) with a side salad (no fries!)
3. Chicken caesar salad (no croutons)
4. Hot smoked black pepper salmon, thick zucchini slices topped with store bought bruschetta

Snack Ideas

1. Hard boiled egg or deviled egg
2. ¼ cup salted nuts
3. Cheddar cheese cubes
4. Fresh vegetables dipped in full fat ranch dressing
5. Monterey Jack cheese, shredded and baked until crispy, dipped in Guacamole

Sample 2 Day Menu

Note: perhaps this doesn't look like a lot of food to you... adding healthy fats like butter, cream, olive oil and coconut oil to your recipes will help you feel full, fats are satiating!

	Day 1		Day 2	
	Food	Carb Count	Food	Carb Count
Breakfast	1/2 cup full fat cottage cheese 1/2 cup frozen mixed berries, thawed 1 tbsp ground flax seed coffee with coconut oil or heavy cream	4g 6g 0g 0.5g	2 eggs 2 cups of spinach 4 sliced cherry tomatoes 4 sliced white mushrooms the above fried in butter coffee with coconut oil or heavy cream	0g 0.5g 1g 1g 0g 0.5g
Lunch	canned tuna 2 tbsp full fat mayonnaise 4 dill pickle slices 4 romaine lettuce leaves 1/4 cup diced cheddar cheese 2 cups beef bone broth	0g 2g 0g 0.5g 0.25g 0g	2 cups ready made coleslaw 1/4 cup tamari almonds <i>(the above fried in butter with Braggs soy sauce)</i> 2 cups chicken bone broth	4g 2g 0g 0g
Dinner	3 oz Chicken breast 1 cup roasted cauliflower with olive oil 2 cups mesclun mix salad topped with sliced cucumbers, red peppers & red cabbage olive oil & lemon juice dressing	0g 4.5g 1g 2g 0g	4 oz Salmon steak topped with heavy cream & dill 1 cup roasted broccoli with coconut oil 1/2 cup sliced red pepper 1/2 cup snow peas <i>(pepper & peas sauteed in butter)</i>	0g 4g 2g 2.5g
Snack	2 devilled eggs	0.25g	30g (~1 ounce) cubed cheddar cheese 4 black olives	1g 0g
Total Carbs	21 grams		18.5 grams	

Grocery List

Dairy Section	Meat/Deli Section	Baking Section
<input type="checkbox"/> Butter <input type="checkbox"/> Heavy cream <input type="checkbox"/> Plain cream cheese <input type="checkbox"/> Plain yogurt <input type="checkbox"/> Cottage cheese <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Eggs <input type="checkbox"/> Beef <input type="checkbox"/> Pork <input type="checkbox"/> Chicken <input type="checkbox"/> Fish & Seafood <input type="checkbox"/> Tofu <input type="checkbox"/>	<input type="checkbox"/> Almond flour <input type="checkbox"/> Coconut flour <input type="checkbox"/> Psyllium husks <input type="checkbox"/> Unsweetened shredded coconut <input type="checkbox"/> 90% dark chocolate <input type="checkbox"/>
Canned Goods	Frozen Section	Produce
<input type="checkbox"/> Light tuna <input type="checkbox"/> Salmon <input type="checkbox"/> Sardines <input type="checkbox"/> Coconut milk <input type="checkbox"/> Crushed/diced/whole tomatoes <input type="checkbox"/> Olives <input type="checkbox"/>	<input type="checkbox"/> Raspberries <input type="checkbox"/> Blueberries <input type="checkbox"/> Strawberries <input type="checkbox"/> Edamame <input type="checkbox"/> Riced cauliflower <input type="checkbox"/>	<input type="checkbox"/> Salad greens <input type="checkbox"/> Coleslaw mix <input type="checkbox"/> Cucumbers <input type="checkbox"/> Zucchini <input type="checkbox"/> Mushrooms <input type="checkbox"/> Onion <input type="checkbox"/> Garlic <input type="checkbox"/>
Nuts & Seeds	Oils & Condiments	Miscellaneous
<input type="checkbox"/> Walnuts <input type="checkbox"/> Almonds <input type="checkbox"/> Pecans <input type="checkbox"/> Sunflower seeds <input type="checkbox"/> Chia seeds <input type="checkbox"/> Flax seeds <input type="checkbox"/> Almond butter <input type="checkbox"/> Peanut butter <input type="checkbox"/>	<input type="checkbox"/> Olive oil <input type="checkbox"/> Coconut oil <input type="checkbox"/> Red wine vinegar <input type="checkbox"/> White wine vinegar <input type="checkbox"/> Apple cider vinegar <input type="checkbox"/> Soy sauce <input type="checkbox"/> Mayonnaise <input type="checkbox"/> Mustard <input type="checkbox"/> Lemon juice <input type="checkbox"/> Lime juice <input type="checkbox"/>	<input type="checkbox"/> Salsa <input type="checkbox"/>

Tracking Carbohydrates and Label Reading

Carb Calculator Tools

We recommend tracking your NET carbohydrates and following your hunger cues (eating only when you are hungry). There are comprehensive food guides listing carbohydrate content such as the one found on www.DitchTheCarbs.com that can be printed out or purchased. The visual food guide of nuts, vegetables, fruits, snacks, other foods, and beverages that are available on the DietDoctor.com website is also recommended to review. We would be happy to help you use other tools such as:

- [Google](#) (list food and carbs)
- [My Fitness Pal](#)
- [Cronometer](#)
- [The Canadian Nutrient File](#)
- [eaTracker](#)
- [Carb Manager](#)

Reading Food Labels

The **Ingredient Listing** goes by order of weight. Let's look at ketchup's ingredient list: *tomato paste, liquid sugar, white vinegar, salt, onion powder, spices*

Because sugar is listed as the second ingredient, we know ketchup has more sugar, by weight, than all the ingredients listed after it. Try to AVOID packaged foods that have sugar listed in their top five ingredients.



When looking at the Nutrition Facts Panel, you do NOT need to track calories. You are interested in **Carbohydrates** and **Fibre**. Because dietary fibre is not absorbed into our body it will not spike your blood sugar and cause insulin to be released. You can subtract the grams of fibre from total carbs to get the **NET CARB** effect of the food you're eating.

Blueberries Raw	
Serving Size	1/2 cup
Carbohydrates	11 grams
Fiber	2 grams
Net Carbohydrates	9 grams



Nutritional Supplements

While you're enrolled in the Valley Metabolic Program, we recommend all participants take the following nutritional supplements:

- ❑ **Vitamin D₃** (2000 IU/day) - your skin requires sunlight to synthesize Vitamin D and most Canadians do not get enough sun exposure to produce what you need. We suggest getting a Vitamin D without calcium to decrease risk of developing kidney stones while on a keto diet.

- ❑ **Magnesium** - magnesium deficiency is common, especially in Diabetes. Choose one of the following types of magnesium supplements:
 - ❑ **Magnesium Glycinate (200 mg to 400 mg/day)** is our recommended form due to better absorption, and this form helps with muscle cramps and sleep disturbance. It is less likely to cause loose stools compared to other magnesium supplements.
 - ❑ **Magnesium Citrate (400 mg/day)** is particularly helpful if you are constipated. This is commonly found over the counter at your pharmacy but make sure to read the label as some formulations add other forms of magnesium.
 - ❑ **Magnesium Oxide (500 mg/day)** is an alternative for significant constipation as this has a greater laxative effect but less likely to help with muscle spasms.

- ❑ **A Multi-Vitamin** could be considered, especially if you find yourself losing weight briskly.

- ❑ **Increased Salt:** as your body switches from burning sugar to burning fat there is significant initial water loss. Secondly, as your insulin levels decrease you will retain less salt so again more dietary salt is needed. The increased salt intake helps avert most of the “keto flu” symptoms. Please follow the instructions below for the first couple of weeks unless otherwise advised by your physician. Home blood pressure monitoring is often helpful during this time for anyone with a history of high blood pressure.
 - ❑ 1 to 2 cups of bouillon or salted bone broth a day, *OR*
 - ❑ 1/2 teaspoon of table salt dissolved in water one to two times a day.

Common Challenges and Possible Side Effects

Don't worry, for the majority of people, these are temporary!

Sugar and Starch Cravings will subside for many people when eating a keto diet. For others, sugars and starches have addictive qualities and may require further support. If you experience cravings, find something to distract you - chew on a toothpick, do a Sudoku puzzle, call a friend, chomp on some fresh veggies.

Keto Flu tends to occur in the first week and especially days 3 to 5. Symptoms can include muscle cramps, fatigue, headache, irritability, brain fog, lack of motivation, dizziness, sugar cravings, and nausea. This is caused by the shift in your metabolism from burning sugar to burning fat. Most of these symptoms are due to lack of water and salt as your body increases urine production as it shifts into ketosis. The cure is adequate hydration (8+ cups/day), more salt as outlined above, making sure you are eating enough fat, and if absolutely necessary, temporarily increasing your carbohydrate intake.

Constipation can occur often due to dehydration. It is recommended to drink plenty of water and eat lots of non-starchy vegetables for fiber (or adding psyllium husk seeds dissolved in water.) If this doesn't resolve constipation you can add magnesium (or milk of magnesia). Adequate salt is also necessary to avoid constipation. Don't be afraid of salt!

Hunger is not necessary on a keto diet. When you are hungry, eat! Protein and fat are very satiating so a meal should satisfy you for at least 4 hours. If not, add more fat to your meals (for example more butter on your cooked vegetables, avocado slices and more olive oil on your salad, or coconut oil in your coffee). See the Healthy Snacks section above for ideas if you frequently need something to eat between meals.

Bad breath can occur due to your body producing certain ketones that are released in your breath. Gums and breath mints (even sugar free ones) will add to your carbohydrate intake so choose wisely. Chewing on fresh parsley can freshen the breath. Be sure to maintain good oral hygiene: brush twice/day, floss daily and consider using a mouth rinse containing xylitol.

Mindless Eating occurs out of habits unrelated to physical hunger or healthy planning. Some of us eat out of routine, not hunger. We snack out of boredom, not hunger. We binge to comfort ourselves, not because we're hungry. Eating patterns can be difficult to break, but it is possible to learn how to listen to your body's hungry/full messages again.

Mindful eating requires planning good food choices ahead of time. It is possible to listen

to your body's hungry and full messages while becoming aware of "feeding" our needs for comfort through planning pleasurable and fulfilling activities alone and with others. It is our hope that as you lose your cravings for sugar on a LCHF diet, you will continue to explore a relationship with food that merges celebration, joy, and nourishment.

Social integration. Food is part of the fabric of our lives. It is very helpful to have a partner (a friend or spouse) that understands why you are making a change in the way of eating. By working together as a group, in person as well as through our VMP Facebook page, we also create our own community which can support us.

Weight Plateaus. Blood glucose control can improve independent of weight loss. A ketogenic diet leads to variable amounts of weight loss for different individuals. Water weight can vary by 2 to 4 lbs in a given day so even if one is losing 1 lb a week of fat (4 lbs in a month) the scale may not change in a month due to simple changes in body water. Look for *non-scale victories* such as blood sugars improving, energy improving, and clothes fitting differently. If the weight isn't decreasing as expected early on it may be due to eating too much hidden carbs or too much dietary fat (e.g. keto fat bombs, cream in the coffee). Also, improving sleep quality, addressing physical or emotional pain, treating medical conditions, and increasing physical activity can help!

Gout is common illness associated with diabetes and insulin resistance. At the beginning of a ketogenic diet, ketones compete with uric acid and uric acid levels rise temporarily in the first few months. This can precipitate a gout attack which should be treated with guidance from your physician. Over time your risk of gout will decline to baseline and with further weight loss and improvements in your diabetes control the risk of gout improves further. Avoiding meat is not necessary.

Hair loss can occur several months after starting a ketogenic diet or after any sort of weight loss. Hair typically will be released from follicles randomly but during a stressful physiologic event (such as weight loss) a large number of follicles will synchronize such that the hairs fall out around the same time. Once this occurs it takes patience for the hair follicles to produce and grow new hair. Some research suggests zinc supplementation may be helpful; however, zinc or no zinc, with time hair thickness should return.

Falling off the bandwagon. It is human nature to revert to previous habits and also to feel shame for not achieving our goals. Life happens. Long term changes in our activity and dietary patterns is one of the more challenging feats we could ask of ourselves. Remember to acknowledge your dignity and start fresh again. If you have T2D and change back to your previous way of eating know that medications may need to be adjusted (often quickly) to avoid high sugars.

Frequently Asked Questions

Don't we need carbohydrates? In short, no! The body is able to generate glucose from the backbone of triglycerides as well as from certain amino acids (the building blocks of protein). This process is called *gluconeogenesis*. By eating a well formulated ketogenic diet that includes lots of green leafy and fibrous vegetables you will get all the minerals, vitamins, and micronutrients that are needed to nourish all the cells of your body.

Isn't eating more fat going to increase my risk of a heart attack? While many nutrition guidelines advocate lowering saturated fat (e.g. the solid form of fat in meat and full fat dairy) the evidence is not clear and is a hotly debated topic in medicine. Diabetes increases blood vessel events (heart attacks and strokes) yet reversing diabetes by LCHF eating leads to improved sugar and most lipid abnormalities. These are signs that a LCHF diet would likely reduce risk of heart attack and stroke. Do we know this for sure? No, a large randomized study is needed.

What about diabetic ketoacidosis (DKA)? This is a life threatening illness that occurs mostly in patients with type 1 diabetes where the pancreas isn't making insulin. This leads to an overwhelming movement of fat energy into the liver and production of ketones that exceeds the body's ability to use them. In DKA blood sugar readings are high, ketones are high, and the blood becomes more acidic. In the Valley Metabolic Program, we aim for *nutritional ketosis* which is a healthy, natural state where blood sugars and blood pH remains normal and blood ketone levels are detectable, but not high.

Is this way of eating sustainable? Yes! In studies it is shown to be just as sustainable as the traditional "low fat" dietary approach to weight loss or diabetes treatment. LCHF brings many medical benefits for patients with T2DM which provides encouragement to continue this new way of eating. Many participants in our Program have reported that discontinuing insulin is highly motivating to continue this way of eating. Many people report an overall improvement in quality of life.

How do I know if I am eating too much protein? We recommend getting enough protein to maintain your lean body mass which tends to be a similar amount of protein one eats on a standard Canadian diet. We provide references in this Guide if you want to track your "macros" (macronutrients), but to keep it simple, have protein at each meal - e.g. 2 eggs at breakfast, ¼ cup of nuts & seeds sprinkled over lunch salad, a portion of meat about the size of the palm of your hand at supper.

What about my gallbladder? You do not need to have a gallbladder to eat LCHF, but if diarrhea or abdominal discomfort occurs let your clinician know. LCHF is not known to cause gallstones; however, a high fat diet will request your gallbladder to contract more frequently which could cause stones to mobilize and cause pain and inflammation that could require surgery.

Why are my sugars higher in the morning? It's called "dawn phenomena" and is not usually related to dietary intake. As morning approaches, hormones increase that cause your liver to release glucose from glycogen (glucose storage). It may take weeks, months, or longer to see fasting sugars normalize. Eating your last meal of the day earlier or adding metformin may help.

For patients with T2D, why are you recommending higher glucose targets in the first few months? In one word, safety! The higher target in at least the first 4 weeks of this Program is set at 7 to 10 mmol/L especially as we reduce medications such as sulfonylureas and insulin (see below) to avoid lows. When you are no longer taking medications that can cause low glucose, we welcome normal blood glucose readings.

What is type 2 diabetes reversal and remission? Diabetes is conventionally thought of as a chronic progressive disease that requires more medication over time. Diabetes reversal is demonstrated when this trajectory is changed. One definition of diabetes reversal is achieving an A1c < 6.5 on metformin alone. Partial diabetes remission is an A1c < 6.5 without medication for more than one year. Complete diabetes remission is defined as an A1c < 5.7 off all medications.

What about non-sugar sweeteners? A ketogenic diet removes sugars and starches which makes it challenging to enjoy sweet drinks, baking, or desserts. Artificial sweeteners may have detrimental metabolic effects but they are a better choice than sugar. They are often part of a ketogenic diet as we not only use food to fuel our bodies but also to enjoy pleasurable tasting food. Stevia, Xylitol and Erythritol are our recommended sweeteners.

Is keto an "all you can eat" fat buffet? No. Especially not at the beginning. Ketogenesis (the state when your body is producing ketones from the breakdown of fat stores) occurs when you restrict carbs as opposed to adding fats or trying to reach a "fat target." As you move from a weight loss phase to a maintenance phase, then you will need to increase your dietary fat intake based on your weight target and hunger cues.

Will I need to eat this way forever? Everyone will have their own “carbohydrate tolerance” in the maintenance phase. Some could tolerate 30 grams a day where others may tolerate up to 100 grams per day. The genetics of the metabolic disease remains and worsening elevated insulin levels, insulin resistance, or elevated glucose will occur above your personal carbohydrate threshold - this may occur either immediately or weeks down the road. Thus it is wise to try to keep carbs to a low level and increase dietary fats for satiety. Keeping previous medications that have been de-prescribed in your cupboard can be a healthy reminder!

What do I need for monitoring? A scale is useful to monitor your weight weekly. A glucometer is useful to track your blood glucose if on insulin or sulfonylurea (or if tracking progress). A blood pressure monitor is helpful, especially if on blood pressure medications. For those that wish to follow ketone levels, ketone strips and a monitor is needed.

Diabetes/Obesity Medications and LCHF Diets

LCHF diets are a safe and sustainable way of eating; however, it is important for you and your clinician to understand that many medications need to be adjusted or discontinued quickly - especially medications known to increase risk of low sugar (hypoglycemia) or lower blood pressure. Other medications are sometimes added to this way of eating in order to further reduce risk of complications of diabetes.

Metformin (Glucophage, Glumetza) is one of the most commonly prescribed and oldest medications for type 2 Diabetes. Metformin may also be found in combination pills with a long list of names. It inhibits the liver from releasing glucose into the bloodstream and increases the body's sensitivity to insulin. Because of its long track record in safety and efficacy in diabetes it is still first line for pharmacologic management of diabetes. Metformin does not cause low sugars and is typically **safe to continue** on a low carbohydrate diet. We will often propose adding metformin to the LCHF intervention if you are not already on it.

Sulfonylureas are medications that stimulate your pancreas to make more insulin. Common sulfonylureas are called Gliclazide (Diamicron), Glimeperide (Amaryl) or Glyburide (Diabeta). On a low carbohydrate diet, sulfonylureas can cause hypoglycemia (low sugar) and are often weaned or discontinued as instructed by your clinician.

SGLT-2 inhibitors are medications that cause the kidney to urinate excess sugar. The current SGLT-2 inhibitors are Dapagliflozin (Forxiga), Canagliflozin (Invokana), and Emagliflozin (Jardiance). In patients at high risk of heart attacks these medications have been shown to lower risk of death and heart attack. They have also been shown to lower risk of worsening kidney disease. Despite the beneficial profile of these medications they are **not safe to use in a low carbohydrate diet** due to risk of causing a life threatening illness called diabetic ketoacidosis (DKA). This medication is typically stopped 3 days prior to the start of a ketogenic diet.

GLP-1 agonists are an injectable medications that have a number of beneficial hormonal effects on diabetes including lowering A1c, appetite, and weight. GLP-1 agonists are medications such as Exenatide (Byetta), Liraglutide (Victoza), Saxenda (higher dose Liraglutide), Dulaglutide (Trulicity), and Semaglutide (Ozempic). They, like the SGLT-2 inhibitors, have been shown to reduce risk of death and vascular events in patients at high risk of having these events. GLP-1 agonists can be used in a VLCHF diet as they do not have risk of DKA or low sugar. One typically needs to have a private insurance plan to cover this medication. Saxenda is one of 3 approved medications for weight loss in Canada and operates largely through lowering the brain's "lipostat" which regulates body fat.

DPP-4 inhibitors are oral therapies that allow your body's own GLP-1 hormone to increase and lead to a modest decrease in average sugar. These medications are called Sitalglipitin (Januvia), Saxagliptin (Onglyz), and Linagliptin (Trajenta). They can be used in a LCHF diet but are often able to be discontinued.

Insulin. These are injectable medications that are classified typically as long acting or short acting. Long acting insulins provide background 12 to 24 hr insulin coverage and include Detemir (Levemir), Glargine (Lantus, Basaglar), or NPH (Humulin –N, Novolin GE NPH). Short acting insulins are used to cover the carbohydrate load of a meal and include Aspart (NovoRapid), Glulisine (Apidra), Lispro (Humalog), and Regular (Humulin R, Novolin ge Toronto). These medications in Type 2 are **weaned (often quickly)** and sometimes discontinued with a LCHF diet.

ACE inhibitors and Angiotensin Receptor Blockers. This class of medications (examples are perindopril, ramipril, or telmisartan) are used in diabetes to lower blood pressure but they also reduce risk of stroke, heart attack, and kidney disease independent of their blood pressure effect in patients who are over 55 or with any history of complications from diabetes. At other times they may need to be reduced or even discontinued if the blood pressure decreases too much while following a LCHF diet. Lightheadedness or a blood pressure of less than 110/60 is a sign that the medication would need to be reduced or stopped.

Statins. These are typically considered “cholesterol” pills but actually they protect blood vessels such that they also reduce risk of stroke, heart attack, and death. They are recommended independent of the value of your LDL (also known as “bad cholesterol”) in anyone with type 2 diabetes over the age of 40. They can be safely used with a LCHF diet.

Diuretics. Include medications such as hydrochlorothiazide, indapamide, or furosemide. They are common blood pressure medications that can often be reduced or lowered.

Nicotine. If you smoke, quitting cigarettes will be of highest priority while engaging in this Program. Nicotine is found in cigarettes and is the most addictive substance known. Smoking has caused devastating consequences to health and are particularly problematic in diabetes.

Bupropion/Naltrexone (Contrave). Is approved by Health Canada for obesity. Its effects are in the brain to lower body weight. Studies show a modest reduction in weight of 4 to 5% compared to placebo with the main side effects of nausea, headache, and constipation.

**** It is very important to follow your doctor's instructions on how to use all medications safely to avoid hypoglycemia. ****

Additional Resources

There are many websites that are full of delicious recipes, weekly meal plans and other tips and tricks to help you transition to a low carb way of eating. If you're not sure of the credibility of a website, let us know and we'll help you assess the content. We encourage you to enroll in the one month free membership with www.DietDoctor.com because of the excellent educational content that we will refer to during the Program.

Here are a few other websites that you might find helpful:

- DitchTheCarbs.com
- KetoSummit.com
- PeaceLoveAndLowCarb.com
- Ruled.me
- LowCarbProgram.com

The Annapolis Valley Regional Library has a good assortment of LCHF related books and cookbooks. If you want to sink your teeth deeper into the science and culture of ketogenic eating, we have listed a few good reads.

- A New Atkins for a New You (2010) by Dr. Eric Westman
- The Obesity Code (2016) by Dr. Jason Fung
- The Lore of Nutrition (2017) by Timothy Noakes and Marika Sboros
- The Case Against Sugar (2016) by Gary Taubes
- The Big Fat Surprise (2014) by Nina Teicholz
- The Art and Science of Low Carbohydrate Living (2011) by Stephen Phinney and Jeff Volek
- The Complete Ketogenic Diet for Beginners (2016) by Amy Ramos
- Everyday Ketogenic Kitchen (2017) by Carolyn Ketchum
- The Easy 5 Ingredient Ketogenic Diet (2018) by Jen Fisch

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