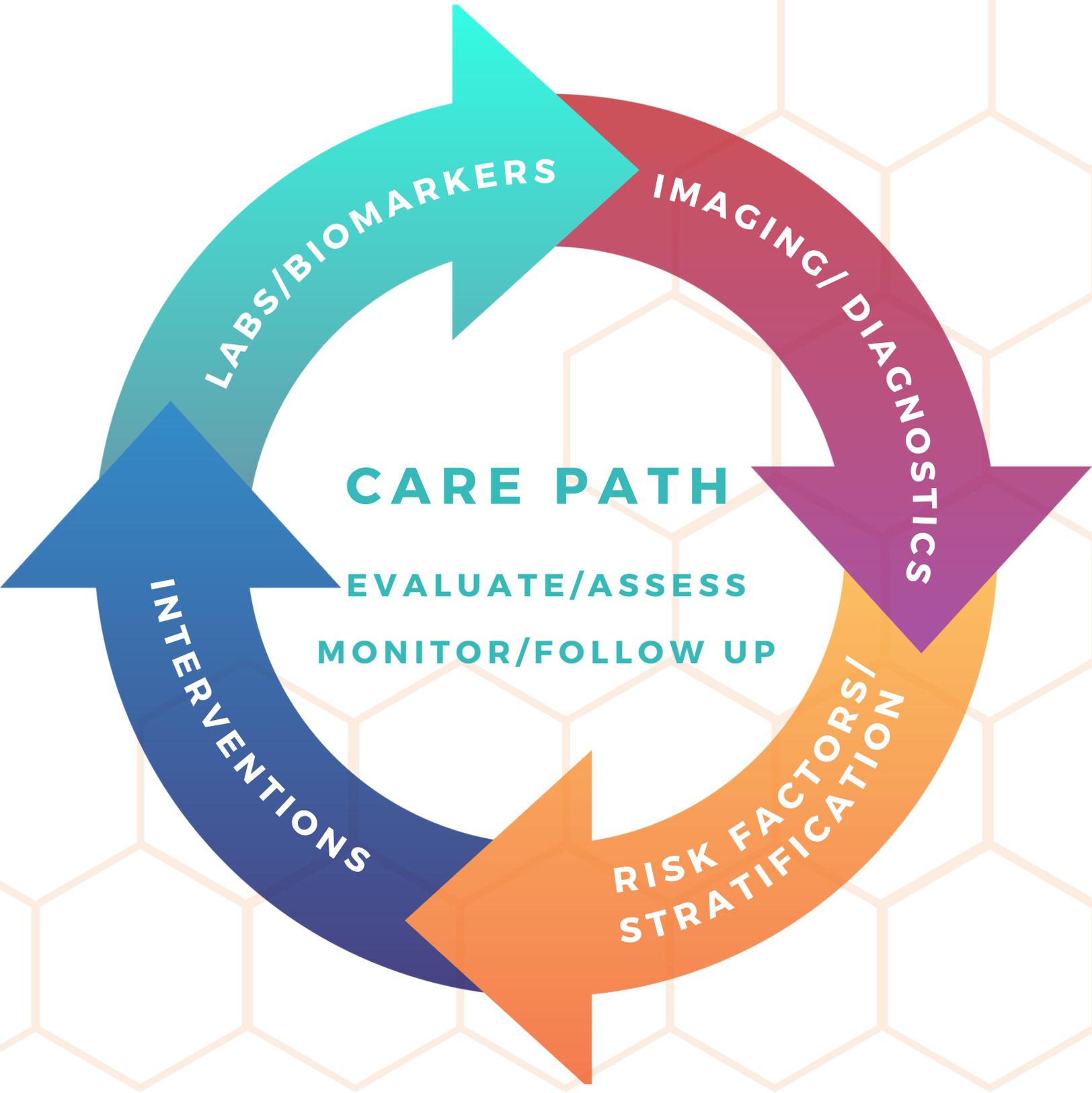


FOUNDATIONAL METABOLIC HEALTH PROTOCOL

Developed by OvationLab

www.ovationlab.com



LABS/ BIOMARKERS

- Trig/HDL Ratio
- Chol/HDL Ratio
- Apolipoprotein B (ApoB)
- Lipoprotein(a)
- hsCRP
- Lp-PLA2
- Myeloperoxidase (MPO)
- Oxidized Lipids
- FBS
- Hgb A1C
- Fasting Insulin
- 2 Hour glucose/insulin challenge
- HOMA-IR Score
- BUN/Albumin
- Uric Acid
- Homocysteine
- ALT/AST/GGT
- Omega Check
- Vit D
- Leptin
- Functional Stool Testing

IMAGING/DIAGNOSTICS/ REMOTE MONITORING

- BIA Scale (Nokia/Withings)
- DEXA
- Oura Ring
- Continuous Glucose Monitor
- BP Cuff
- Carotid Intima-Media Thickness (CIMT)
- Coronary Artery Calcium Score (CAC)

RISK FACTORS/ STRATIFICATION

- Genetics, Family History
- Standard American Diet
- Glycemic Load
- Body Composition
- Sedentary Activity Level
- Sleep Apnea

INTERVENTIONS

- Modified Mediterranean Diet
- Movement/Exercise
- Sleep
- Stress and Relaxation
- Social Connection
- Foundational Dietary Supplements
 - Protein (incl. glutamine if possible): Start with a general dose of 10-20 grams daily
 - Aminos + HMB: 3000 mg (1500 mg twice daily)
 - Fibermend: 1 scoop daily
 - EPA/DHA: 2 grams combined daily EPA/DHA (adjust dose based on testing)
 - Vitamin D+K2: 5000 IUs (adjust dose based on testing) + 25-95 mcg (depending on dose of vitamin D) daily
- Specialty Dietary Supplements
 - Live akkermansia (Pendulum Glucose Control Pro): 1 twice daily
 - Berberine: 1500 mg daily (500 mg three times daily)
 - Creatine monohydrate: 5 g daily
 - Calocurb (Amarasate®): 1 capsule daily for 2-3 days and build up to two capsules 1 hour before a meal. Up to four capsules can be taken per day.
 - HiPhenolic (Metabolaid): 2 capsules daily
 - MetaGlycemX™ (combo of more 'traditional' blood sugar/weight support eg. EGCG, ALA, chromium, cinnamon): 2-3 capsules daily - adjust dose based on testing.

An advanced lipid panel, which measures the number and size of LDL particles can indicate changes in lipid oxidation, a rise in triglyceride (TG) production, and shifts in lipoprotein concentrations. These changes can be due to an increase in circulating free fatty acids (FFAs), which is a common result of insulin resistance. (1)

Optimal Ranges

- Trig/HDL ratio <3.8
- Chol/HDL ratio <6
- Apolipoprotein B (ApoB) <90
- Lipoprotein(a) <75
- hsCRP <1.0
- Lp-PLA2 <123
- Myeloperoxidase (MPO) <470
- Oxidized Lipids <60

Lab values indicating prediabetes, insulin resistance, or metabolic syndrome should be considered indicators of increased risk of cardiometabolic disease progression. (1)

- FBS < 95 (80-88 optimal)
- Hgb A1C <5.3
- Fasting insulin <7.0
- 2 Hour glucose/insulin challenge (in office)
- HOMA-IR Score < 3
- BUN/Albumin >4

Markers of inflammation and oxidative stress are associated with increased cardiometabolic risk.

- Uric Acid <5.5
 - Although uric acid has the potential for antioxidant support, hyperuricemia is associated with an increased risk of metabolic diseases such as MetS, IR, and MASLD. (2)

Homocysteine (<9)

- Hyperhomocysteinemia is associated with metabolic syndrome and obesity due to vascular and DNA damage due to oxidative stress. Deficiencies in folate and vitamin b12 can contribute to elevated levels of homocysteine. (3)

ALT (13-22) /AST(12-25) /GGT (12-24)

- Elevations in all liver enzymes have been associated with metabolic syndrome. Liver changes associated with hepatic steatosis may contribute to insulin resistance and may be an early sign of metabolic diseases. (4)

LABS/BIOMARKERS

Omega Check >5.9

- An Omega Check measures omega-3 polyunsaturated fatty acids (PUFAs) and total fatty acid (FA) levels in whole blood, and an Omega-3 index in red blood cells (RBCs). These markers are linked to diabetes outcomes, with higher omega-3 levels associated with lower risk of T2DM. (5,6)

Vit D 25 -OH 60-80

- Serum vitamin D levels are inversely associated with the risk of abdominal obesity in adults. Each 25 nmol/L increase of serum vitamin D may be associated with an 8% reduced risk of abdominal obesity. (7)
- Vitamin D deficiency has also been shown to be associated with increased BMI and inflammation, which may have adverse effects on metabolic health when obesity is also a contributing factor. (8)

Leptin

- Stress-related elevations in cortisol can contribute to HPA axis dysregulation that can correlate with body composition shifts that can be indicators of metabolic disease, such as increased visceral fat, decreased lean body mass, and loss of bone mineral density. (9)

Functional Stool Testing

- Cardiometabolic disease is associated with a gut microbiome profile characterized by decreased abundance of gut microbiota, lack of SCFA-producing bacteria, and abnormal trimethylamine metabolism. These dysbiotic shifts contribute to gut barrier inflammation, intestinal permeability, and systemic inflammatory response that can result in metabolic diseases related to insulin resistance and lipid metabolism. (10)

BODY COMPOSITION ANALYSIS

Body composition analysis is useful for quantifying body fat and its distribution in the body, which is a significant risk factor for cardiometabolic diseases. Adipose tissue stored in the abdominal region is linked to complications and mortality associated with obesity. In contrast, adipose tissue in the gluteofemoral region is associated with lipid and glucose markers that are protective against metabolic diseases, even after considering total body fat. (11)

BIA Scale (Nokia/Withings) (bioimpedance analysis)

- Non-invasive, accessible (12)
- Unable to detect body fat distribution (12)
- Estimates body composition based on the transit time of a low-voltage electric current through the body, which is dependent on body composition characteristics. (13)
- BIA estimates body composition parameters based on body fluid volume measurement: total body water (TBW) and fat-free mass (FFM), which encompasses BMC, extracellular water, intracellular water, and visceral protein. (13)
 - Provides the ability to follow body composition shifts over time.
 - Influenced by physical exercise and food or fluid intake before measurements, and other conditions that can modify an individuals' hydration level (i.e. dehydration/edema).
- Can be incorporated with tape-measured waist circumference for assessment of android fat. (14)

DEXA (Dual-energy X-ray absorptiometry)

- Indirect measurement that provides exact body composition measurements and distributions. (12)
 - The gold standard for measuring muscle mass (15)
- Technical expertise required (12)
- Though DEXA is primarily used to assess bone health, we are referring to total body DEXA scans that provide accurate estimates of bone mineral content (BMC), fat mass (FM), and lean body mass (LBM) throughout the body, via measurement of low-emission X-ray beams as they pass through body tissues. (13)
- Limit to 2 body scans per year. (13)
 - Effective radiation dose (1-7 μ Sv \sim 1-10% of CXR radiation dose).

IMAGING/DIAGNOSTICS

Coronary Artery Calcium Score (CAC) (Based on testing and PMHx)

- A coronary artery calcium score allows additional imaging markers of metabolic health, such as epicardial fat and liver fat. (19)
- This non-invasive examination is performed without contrast or IV injection.
- It takes under a minute, is painless, is not claustrophobic, and has a radiation exposure similar to a mammogram.
- In many cities it costs \$100 or less.
- Results range from the ideal zero to over 1,000.

Carotid Intima-Media Thickness (CIMT)

- Research suggests that in obese individuals, impaired metabolic health and reduced cardiorespiratory fitness are independently associated with increased CIMT. (18)
- This is an ultrasound examination of the carotid arteries.
- The images are analyzed with digital software and the thickness of the inner 2 layers of the carotids are measured in mm.

REMOTE MONITORING/WEARABLES

Oura Ring

The Oura Ring is a wearable device that utilizes movement-tracking sensors and light-based technology to track health metrics such as daily activity, sleep quality, heart rate, and body temperature. (16)

Continuous Glucose Monitor (CGM's)

CGMs continuously measure glucose concentrations in the subcutaneous interstitial fluid. (17)

Diabetes management

- Time in Range (TIR) 70-180 mg/dL is associated with diabetes complications and outcomes
- Time in Tight Range (TIR) 70-140 mg/dL (for A1C targets <7%, where TIR is less sensitive to changes in average BG).

Blood Pressure Cuff (Nokia/ Withings)

Genetics, Family History

- Genetic polymorphisms (single-nucleotide polymorphisms, SNPs), that result in dysfunctional metabolic pathways and genetic factors influenced by diet, can predispose certain individuals to developing metabolic disorders. (20)
- Identifying genetic predispositions, most notably SNPs, that mediate weight gain by affecting responses to high-saturated-fat diets, and genes that regulate carbohydrate and lipid metabolism, energy management, and digestive enzymes, allow for improved risk stratification and management of metabolic diseases through personalized nutritional recommendations. (21)
- Family history is a strong risk factor for diabetes as a result of metabolic dysfunction, which is independent of lifestyle and other metabolic factors. (22)

Standard American Diet

- The Standard American diet is characterized by high consumption of red meat, meat products, saturated fat, and sugary foods, and is associated with an increased risk of developing metabolic diseases such as diabetes and CHD. (23)

Glycemic Load

- Glycemic load is calculated by multiplying a food's glycemic index by its carbohydrate content, with higher values indicating more refined grains, starches, and sugars. (24)
- The importance of glycemic load as a dietary risk factor for metabolic disease is supported by evidence that nutrition patterns with a lower glycemic load can reduce postprandial blood sugar spikes and improve long-term glycemic control, and therefore metabolic health. (25)

Body Composition

- "Apple-shaped" bodies demonstrate excess central or abdominal visceral adipose tissue that is associated with an increased risk of developing insulin resistance compared to those with "pear-shaped" bodies which demonstrate subcutaneous fat accumulation. (1)

Sedentary Activity Level

- Sedentary activity for 4 or more hours daily has been associated with an increased risk of metabolic syndrome, independent of physical activity. (26,27)

INTERVENTIONS



Modified Mediterranean Diet 40/30/30

- The Mediterranean Diet (MD) is characterized by an increased intake of olive oil, fruits, vegetables, legumes, nuts, and non-refined cereals, allowance of fish and poultry, and low/moderate intake of dairy products, alcohol, red meat, and desserts. Meta-analyses reveal that the MD is associated with beneficial changes in biomarkers of metabolic dysfunction (body weight, BMI, WC, glucose, insulin, HOMA-IR index, advanced lipid profiles, hepatic function tests, and inflammatory markers). (29) These biomarker changes are associated with reduced intake of saturated fats, amino acids, and calories, and increased phytochemicals and gut microbiota-produced metabolites. (30)
- This 40/30/30 macronutrient breakdown is associated with reductions in body weight, LDL reduction, and improvements in both SBP and DBP, which may contribute to improved metabolic health. (31)

Movement/Exercise (Resistance Training)

- Resistance training to promote lean muscle mass has been associated with reduced body fat percentage, body fat mass, and visceral fat in healthy adults. (32)
- When combined with high-intensity aerobic training, high-load resistance training can have beneficial effects of reducing abdominal adiposity, increasing lean body mass, increasing cardiorespiratory fitness, and ultimately metabolic health. (33)

Sleep

- Those with normal sleep (7-8 hours per day) were shown to have a lower risk for metabolic syndrome compared to those with 5 hours or less and 9 hours or more of sleep per day. (28)

Stress and Relaxation

- Low levels of or no stress may be associated with a reduced risk of metabolic syndrome. (27)

Social Connection

- Loneliness as a result of social disconnection may be perceived as a chronic psychosocial stressor resulting in an overactive HPA axis, mitochondrial dysfunction, and ultimately metabolic diseases such as metabolic syndrome. (34) Research shows an association between social connectedness and a reduced risk of obesity and hypertension, highlighting the protective impact of social integration across life stages. (35)

Protein (to include glutamine if possible): Start with a general dose of 10-20 grams daily

- The dose varies from 7-30 grams, depending on the amino acid profile or if it's an isolated amino acid. (67-70)
- For glutamine, a 15-30 gram dose is required to leverage its beneficial metabolic effects as a GLP-1 enhancer (67-70)
- GLP-1 secretion is enhanced by all forms of dietary proteins,--from whole proteins to peptides and amino acids--each interacting with unique or unknown cellular mechanisms based on their structure. (67-70)

Aminos + HMB: 3000 mg (1500 mg twice daily)

- A metabolite of the amino acid leucine - early studies show a positive impact of HMB supplementation in mitigating age-related losses of lean mass in older persons. (83)

Vitamin D+K2: 5000 IUs (adjust dose based on testing) + 25-95 mcg (depending on dose of vitamin D) daily

- Vitamin D+K supplementation is linked to improved metabolic health, enhancing GLP-1 levels and bone metabolism. (80-82)

Fibermend: 1 scoop daily

- Fibermend, rich in dietary and soluble fibers, including guar gum and larch arabinogalactan, supports metabolic health by moderating energy intake, stabilizing postprandial blood glucose levels, and improving satiety, ultimately addressing risk factors for obesity, hyperglycemia, and hypercholesterolemia. These ingredients are resistant to digestion and promote beneficial gastrointestinal microflora and short-chain fatty acid production, supporting a healthy gut environment that favors optimal metabolic health. (74-77)

EPA/DHA: 2 grams combined daily (adjust dose based on testing)

- Omega-3 fatty acids offer therapeutic benefits for metabolic health by minimizing muscle loss and inflammation associated with secondary sarcopenia, through its ability to modulate proteolytic pathways that result in skeletal muscle regeneration. (78-79)

Live akkermansia (Pendulum Glucose Control Pro): 1 twice daily

- Akkermansia muciniphilia plays a crucial role in improving metabolic health by modulating glucose and lipid metabolism and reducing inflammation, ultimately reducing insulin resistance and hyperglycemia. (36,37)

Berberine: 1500 mg daily (500 mg three times daily)

- By activating bitter taste receptor pathways and enhancing mitochondrial function, berberine supports GLP-1 secretion and biosynthesis, resulting in enhanced metabolic health in both nondiabetic and diabetic individuals. (38-40)

Creatine monohydrate: 5 g daily

- Creatine enhances metabolic health by effectively reducing immediate muscle damage within the first 96 hours following exercise, promoting a faster and more effective recovery. (41-44)

HiPhenolic (Metabolaid): 2 capsules daily

- Hi-Phenolic contains Metabolaid, a blend of hibiscus and lemon verbena extracts, with green coffee bean extract and magnesium citrate, to support metabolic health by increasing metabolic function, maintaining normal blood pressure levels, and facilitating healthy weight management through improved fat metabolism and enhanced energy expenditure. (48-58)

Calocurb (Amarasate®): 1 capsule daily for 2-3 days and build up to two capsules 1 hour before a meal. Up to four capsules can be taken per day

- Amarasate, the active ingredient found in Calocurb, has been shown to enhance the body's natural GLP-1 and CCK hormone levels, providing an effective, natural appetite control mechanism that contrasts with the constant and supra-physiological hormone levels achieved by current anti-obesity medications, with upcoming studies aiming to further validate its weight-loss efficacy and its promising impact on postprandial glucose levels without affecting insulin. (45-47)

MetaGlycemX™ (combo of more 'traditional' blood sugar/weight support eg. EGCG, ALA, chromium, cinnamon): 2-3 capsules daily - adjust dose based on testing

- Metaglycemx supports blood sugar and weight management by combining the GLP-1 secretion benefits of green/mate tea and cinnamon, the insulin-mimetic and beta-cell influencing actions of ALA, which also lowers A1C, insulin levels, HOMA-IR, triglycerides, and LDL cholesterol, and the insulin signaling and sensitivity improvements provided by chromium, further influencing blood pressure, lipid profiles, inflammation, and oxidative stress. (59-66)

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