

**Putting Nutrition and Supplementation
Therapy Into Pharmacy Practice: Diabetes
and Inflammation**

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No Conflict of Interest

- I am not sponsored or speaking on any topic for pay by any company

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FOOD AS MEDICINE



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High Blood Pressure

- Twenty one percent of school children (age 10-12) had HBP (28.7% for adults in 2002)
 - Hispanic
 - Female
 - Obese
 - Three times more likely to have HBP

• Ximena Lirio-Rojas, et al. high blood pressure in school children: prevalence and risk factors. *Pediatrics* 2006; 118(1):2411-6-12

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Diabetes

- 150,000-210,000 children have diabetes in U.S.
 - Increasing numbers of Type II (Insulin Resistance)*
 - Trans fats
 - High fructose corn syrup
- 13,000/yr. diagnosed with type I diabetes
 - European studies show increase
 - No studies in the U.S.
 - "Autoimmune" some research implicates mumps

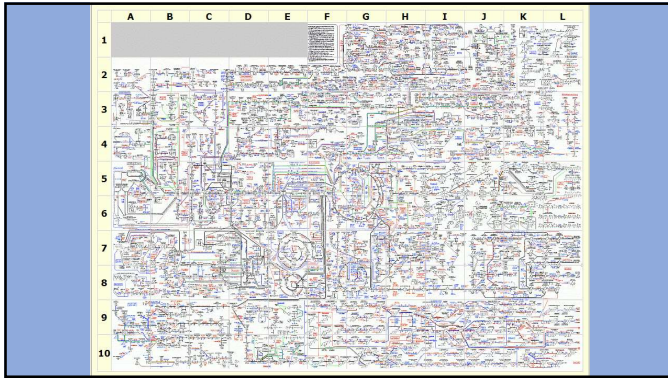
Hiday H, et al. Mumps infection in the etiology of type 1 (insulin-dependent) diabetes. *Diabetes Res.* 1988 Nov;5(5):111-6.
* CDC website on diabetes in children

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Clinical Nutrition

- Clinical Nutrition is an approach informed by science to create balance and wellness based on what the body needs to thrive.
 - Based on:
 - Physiology
 - Biochemistry
 - Genomics
- Recognizes that optimizing mind and body states are integral to health.
- No two people are alike
- Removal biologic, physiologic and emotional interference

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History

- Since time began we ate foods and herbs to heal us
 - We eat baked potato or a juice
 - Dogs eat grass
 - Aloe Vera
- Pompeii- medicinal gardens
- England- Chaucer wrote about medicinal gardens

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Stages of Nutrient Deficient Diseases

Initial Biochemical Alterations	Impaired Cellular Function	Morphologic and Functional Changes	Diagnosed Pathology
No Overt Symptoms	Subclinical Manifestations	Early Stage Disease	End Organ Failure and DEATH

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Theories for Healing with Food

- Antioxidants
 - Glutathione
 - Polyphenols /bioflavonoids
- Vitamins
- Enzymes
- Fatty Acids
- Sugars
 - glyconutrients

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Scurvy

- Vitamin C Needed to make collagen
 - Most abundant protein in mammals
 - 25-35% of whole-body protein content
- Symptoms
 - Bleeding from weak capillaries
 - Mitral Valve (Barlow's in infants) *Pregnant women should not take high dose vitamin C
- Depression
- Immobility
- DEATH

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Probiotics

- Help prevent or treat diarrhea caused by infections or antibiotics.
- Improve systems of irritable bowel syndrome.
- Can boost the immune system.
- Alleviate autoimmune conditions
 - RA, Lupus, Crohn's, Thyroiditis, Ulcerative Colitis, IBD, MS
- Probiotics can reduce inflammation and allergies.
- Clear Toxins
- Make Vitamins

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Probiotic Foods

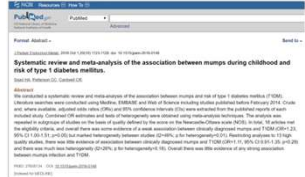


- Yogurt
- Cottage Cheese
- Unpasteurized cheese and other dairy
- Pickles
- Sauerkraut
- Kimchi
- Kombucha
- Pickled Beets

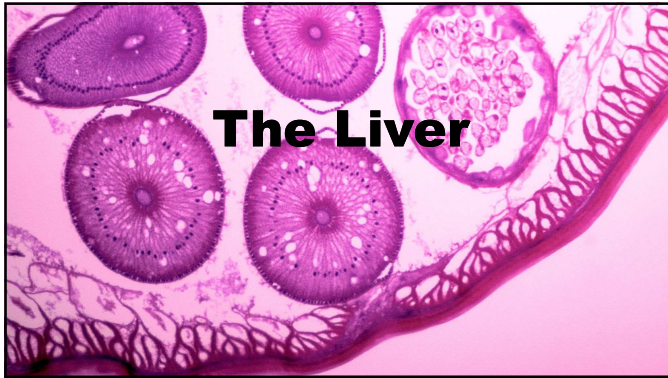
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Viruses and Type 1 Diabetes

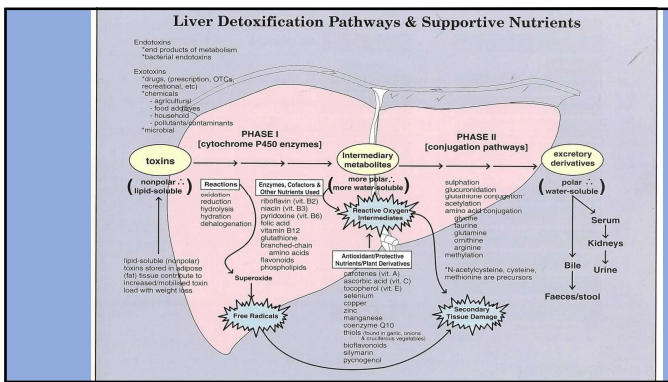
- Mumps
- Coxsackie
- CMV
- EBV



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Weight and NAFLD

- Correlation goes both ways
- Weight gain associated with increase NAFLD
- NAFLD associated with increase obesity
- Detoxify

Annals of Gastroenterology

The association of weight gain with metabolic fatty liver disease and fibrosis severity by fibrosis in the United States

Associated Data

Abstract

Weight gain in 10 years was associated with increased odds of NAFLD and significant fibrosis. NAFLD severity was associated with weight gain and significant fibrosis was associated with weight gain. Weight gain and significant fibrosis were associated with increased odds of NAFLD and significant fibrosis.

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Review | J Inher Metab Dis. 1991;14(4):421-30. doi: 10.1007/BF01797915.

Detoxification pathways in the liver


D M Grant¹

Affiliations + expand
PMID: 1749210 DOI: 10.1007/BF01797915

Abstract

The liver plays an important role in protecting the organism from potentially toxic chemical insults through its capacity to convert lipophilic into more water-soluble metabolites which can be efficiently eliminated from the body via the urine. This protective ability of the liver stems from the expression of a wide variety of xenobiotic biotransforming enzymes whose common underlying feature is their ability to catalyze the oxidation, reduction and hydrolysis (Phase I) and/or conjugation (Phase II) of functional groups on drug and chemical molecules. The broad substrate specificity, isoenzyme multiplicity and inducibility of many of these enzyme systems make them particularly well adapted to handling the vast array of different chemical structures in the environment to which we are exposed daily. However, some chemicals may also be converted to more toxic metabolites by certain of these enzymes, implying that variations in the latter may be important predisposing factors for toxicity. Pharmacogenetic defects of xenobiotic biotransformation enzymes, a subclass of inborn errors of metabolism which are manifested only upon drug challenge, introduce marked variation into human populations for the pharmacokinetics and pharmacodynamics of therapeutic and toxic agents, and thus may have important clinical consequences for drug efficacy and toxicity.

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Modulation of Metabolic Detoxification Pathways Using Foods and Food-Derived Components: A Scientific Review with Clinical Application

- Research into human biotransformation and elimination systems continues to evolve. Various clinical and in vivo studies have been undertaken to evaluate the effects of foods and food-derived components on the activity of detoxification pathways, including phase I cytochrome P450 enzymes, phase II conjugation enzymes, Nrf2 signaling, and metallothionein.
- Much research has been done on herbs and foods to examine the effect on detoxification.
- There are clinical applications to alter detoxification pathway activity and improve patient outcomes.
- "Some caution is recommended, however, due to the limitations of current research as well as indications that many nutrients exert biphasic, dose-dependent effects and that genetic polymorphisms may alter outcomes. A whole-foods approach may, therefore, be prudent".

Hodges RE, Minich DM. Modulation of Metabolic Detoxification Pathways Using Foods and Food-Derived Components: A Scientific Review with Clinical Application. *J Nutr Metab*. 2015;2015:760689. doi: 10.1155/2015/760689. Epub 2015 Jun 16. PMID: 26167071; PMCID: PMC4488002.

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Specific foods may upregulate or favorably balance metabolic pathways to assist with toxin biotransformation and subsequent elimination

including phase I cytochrome enzymes, phase II conjugation enzymes, antioxidant support systems, and metallothionein upregulation for heavy metal metabolism.

phase II enzymes

- UDP-glucuronosyl transferases
- glutathione S-transferases
- amino acid transferases
- N-acetyl transferases
- methyltransferases.

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Phase I Cytochrome P450 Enzymes

- The first defense employed by the body for biotransformation
 - Xenobiotics
 - Steroid hormones
 - Pharmaceuticals
- Microsomal membrane-bound, heme-thiolate proteins, located mainly in the liver, but also in enterocytes, kidneys, lung, and even the brain
- Responsible for the oxidation, peroxidation, and reduction of several endogenous and exogenous substrates

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CYP450 Enzyme System

- Specifically, the function of CYP450 enzymes is to add a reactive group such as a hydroxyl, carboxyl, or an amino group through oxidation, reduction, and/or hydrolysis reactions. These initial reactions have the potential to create oxidative damage within cell systems because of the resulting formation of reactive electrophilic species.
- The ability of an individual to metabolize 90% of currently used drugs will largely depend on the genetic expression of these enzymes
- There are CYP450 polymorphisms (genetic variances)

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Foods and Herbs that work to increase

Table 7
(A) In vivo example substrate inhibitors of glutathione S-transferase (GST); (B) In vivo example substrate inhibitors of glutathione S-transferase (GST); (C) Selected dietary sources of nutrients that glutathione support (L-1, L-2) (unless otherwise noted).

Example	Food, herb(s), or bioactive compound(s) found naturally in nature	Type of study	Organism used and references
(A)	Cruciferous vegetables	Clinical	approximately 9 and 10 servings/d of cruciferous vegetables containing isothiocyanate, indole-3-carbinol, and flavonoid compounds (and other phytochemicals) (L-1, L-2)
	Allylic vegetables	Clinical	~3.0 g/d of diallyl disulfide (L-1, L-2) and 100 mg of curcumin or 100 mg of resveratrol (L-1, L-2) and 100 mg of curcumin or 100 mg of resveratrol (L-1, L-2)
(B)	Resveratrol	Clinical	1000 µg/d resveratrol (L-1, L-2)
	Quercetin	Clinical	1 g/d quercetin (L-1, L-2)
(C)	Citrus	Observational in vivo	~700 µg/d citrus (L-1, L-2)
	Tea	In vivo	20 mg bioactive flavonoids or 2 cups of tea (L-1, L-2)
(D)	Tea	In vivo	90 to 200 mg/kg body wt (L-1, L-2)
	Black soybean	In vivo	200 mg/kg body wt (L-1, L-2)
(E)	Black soybean	In vivo	1 g/kg body wt (L-1, L-2)
	Purple sweet potato	In vivo	1000 and 2000 mg/kg anthocyanins (L-1, L-2)

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Liver Detoxifiers

Stimulate bile production by hepatocytes

Milk Thistle

Burdock

Mag Sulfate (Epsom salts)

Cynara scolymus (Artichoke leaf extract)


Barberry

Oregon Grape

Dandelion

Turmeric

Beets



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Pancreas and Sugar Handling

Alpha Cells secrete glucagon

- A peptide hormone that stimulates enzymatic breakdown of glycogen to glucose in liver
- Gluconeogenesis in the liver
 - Amino acids to glucose

Beta Cells secrete insulin

Delta Cells secrete somatostatin

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Insulin

- Mediates the storage of carbohydrates, proteins, fats, and proteins.
- Facilitates cellular growth
- Enhances liver, adipose, and muscle metabolism
- Needs Zn⁺
- All cells use insulin in order to absorb glucose, except for the tissues found in the retina, nerves, and kidney
 - tissues where insulin is not required for the entry of glucose into the cell, the excess glucose that freely enters the cells is broken down into sugar alcohols (polyols). When in excess, these sugar alcohols are the cause of secondary complications of diabetes
- Decreased insulin secretion or decreased numbers of insulin receptors are the main causes of impaired glucose intolerance.

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Insulin

- In a patient with diabetes, insulin can be given to mimic the normal physiologic process. Insulin regimen include:
 - **Basal insulin:** Long-acting or intermediate-acting insulin (mostly affects fasting blood glucose)
 - **Bolus insulin:** rapid or short-acting insulin, mainly used for two purposes:
 - Prandial (mealtime) in fixed doses
 - Correction for acute elevations in response to SMBG

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Glycemic Target


- **Adult treatment goals**
- A1C: < 6.5-7%
- Preprandial plasma glucose: 80-130mg/dL
- Peak postprandial plasma glucose: <180mg/dL
- **Assessing Glucose techniques**
- Primary techniques for assessing glycemic control are self monitoring of blood glucose, using a glucose meter to test plasma glucose and measurement of A1C.
- A1C should be measured quarterly who are not at goal, or when treatment has recently changed, and at least twice per year if patient are at goal and have stable glycemic control
- 2. American Diabetes Association (ADA). Standards of Medical Care in Diabetes-2023.Diabetes Care.2019; (suppl 1):S1-S193

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Diabetes Complications

- **Microvascular Disease (small artery disease)**
- Retinopathy (most common)
- Diabetic kidney disease (may progress to ESRD)
- Increased risk for foot infections and amputations
- Erectile dysfunction
- Loss of bladder control/UTIs
- **Macrovascular Disease (large blood vessels)**
- Coronary artery disease (stable angina, myocardial infarction)
- Stroke /Transient ischemic attack (mini stroke)
- 2.American Diabetes Association (ADA). Standards of Medical Care in Diabetes-2019.Diabetes Care.2019; (suppl 1):S1-S193

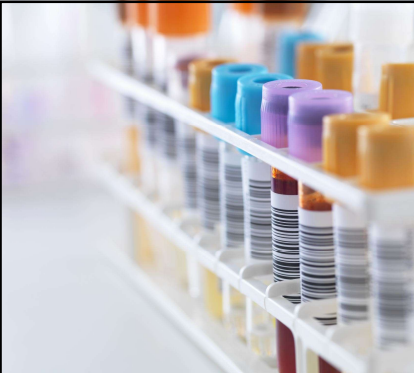
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Hypoglycemia and Diet

- Low carbohydrate (40%)
 - Take away cheap man-made sources that are "simple and refined"
 - Glycemic Index
- Whole food
- Organic Food
- Moderate Protein (30%)
- Moderate Fat (30%)

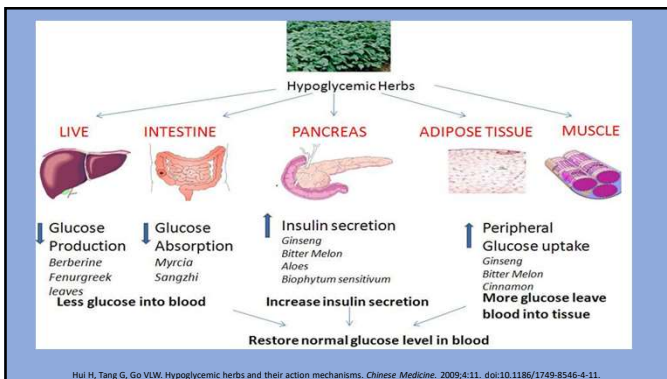
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Hypoglycemic Factors

- Stress
 - Low BS stimulates adrenal
 - Cortisol raises blood sugar
- Liver Support
- Exercise
- Supplement support

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Chromium Medicinal Uses

- In addition to a reduction of fasting blood glucose, studies have also shown a reduction of serum lipids in response to chromium supplementation over 6 to 16 months
 - ****Administering 250 µg of chromium daily over 6 to 16 months led to increased HDL and reduced triglycerides
- Healthy individuals can benefit from 200 µg of chromium daily. However, those with diabetes or dyslipidemia may need higher doses of 400 to 600 µg daily to experience benefit.

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Green Tea Medicinal Uses

- High-dosage (daily dosage of 856.8 mg) green tea extract (Epigallocatechin gallate, EGCG) treatment was found to significantly reduce body weight in women with central obesity.
- The mechanism of high-dose EGCG in obesity might be through decreasing the secretion of ghrelin (same as increasing leptin) and lead to increase of adiponectin level.
 - Ghrelin is termed the 'hunger hormone' because it stimulates appetite, increases food intake and promotes fat storage.
 - Adiponectin is a hormone your adipose (fat) tissue releases that helps with insulin sensitivity and inflammation. Low levels of adiponectin are associated with several conditions, including obesity, Type 2 diabetes and atherosclerosis.

Pathways by which green tea extract help to lose body weight.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4210474/figure/fig1/>

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Green Tea Medicinal Uses

- A total of 115 women with central obesity were screened.
- 102 of them with a body mass index (BMI) ≥ 27 kg/m² and a waist circumference (WC) ≥ 80 cm were eligible for the study.
- These women were randomly assigned to either a high-dose green tea group or placebo group.
- The total treatment time was 12 weeks.
- Significant weight loss, from 76.8 ± 11.3 kg to 75.7 ± 11.5 kg (p = 0.025), as well as decreases in BMI (p = 0.018) and waist circumference (p = 0.023) were observed.
- Consistent trend of decreased total cholesterol, reaching 5.33%, and decreased LDL plasma levels were also observed.
- High-dosage EGCG treatment has good tolerance among subjects without any side effect or adverse effect.

Therapeutic effect of high-dose green tea extract on weight reduction: A randomized, double-blind, placebo-controlled clinical trial

Ju-Chan ¹, Chia-Hsiu ¹, Jung-Hong Chiu ¹, Chung-Hua Hsu ¹

¹Antitumor & wound

PMID: 20059338 DOI: 10.1038/nrn.2010.05.003

Abstract

Background and aims: To examine the effect and safety of high-dose green tea extract (epigallocatechin gallate, EGCG) at a daily dosage of 856.8 mg on weight reduction and changes of lipid profile and obesity-related hormone peptides in women with central obesity.

Methods: We conducted a randomized, double-blind trial registered under ClinicalTrials.gov identifier no. NCT02104704. A total of 115 women with central obesity were screened at our clinic; 102 of them with a body mass index (BMI) ≥ 27 kg/m² and a waist circumference (WC) ≥ 80 cm were eligible for the study. These women were randomly assigned to either a high-dose green tea group or placebo group. The total treatment time was 12 weeks. The main outcome measures were anthropometric measurements, lipid profiles, and obesity-related hormone peptides including leptin, adiponectin, ghrelin, and insulin.

Results: Significant weight loss, from 76.8 ± 11.3 kg to 75.7 ± 11.5 kg (p = 0.025), as well as decreases in BMI (p = 0.018) and waist circumference (p = 0.023) were observed in the treatment group after 12 weeks of high-dose EGCG treatment. This study also demonstrated a consistent trend of decreased total cholesterol, reaching 5.33%, and decreased LDL plasma levels. There was good tolerance of the treatment among subjects without any side effects or adverse events. Significantly lower ghrelin levels and elevated adiponectin levels were detected in the study group than in the placebo group.

Conclusion: 12 weeks of treatment with high-dose green tea extract resulted in significant weight loss, reduced waist circumference, and a consistent decrease in total cholesterol and LDL plasma levels without any side effects or adverse effects in women with central obesity. The anticancer mechanism of high-dose green tea extract might be associated in part with ghrelin secretion inhibition, leading to increased adiponectin levels.

Keywords: EGCG, Epigallocatechin gallate, Green tea extract, Chinese women.

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<http://www.elsevier.com/locate/journalofclinicalnutritionandmetabolism>

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Berberine Medicinal Uses

- Berberine, extracted from *Coptis Root* and *Phellodendron Chinese*, has been frequently used for the adjuvant treatment of type 2 DM, hyperlipidemia, and hypertension.

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Berberine - Meta Analysis Review

Twenty-seven randomized controlled clinical trials were included with 2569 patients.

Seven subgroups in the meta-analysis:

- berberine versus placebo or berberine with intensive lifestyle intervention versus intensive lifestyle intervention alone;
- berberine combined with oral hypoglycemic versus hypoglycemic alone;
- berberine versus oral hypoglycemic;
- berberine combined with oral lipid lowering drugs versus lipid lowering drugs alone;
- berberine versus oral lipid lowering drugs;
- berberine combined with oral hypotensur versus hypotensive medications;
- berberine versus oral hypotensive medications.

In the treatment of type 2 diabetes mellitus, we found that berberine with lifestyle intervention tended to lower the level of FPG, PPG and HbA_{1c} more than lifestyle intervention alone or placebo; the same as berberine combined with oral hypoglycemics to the same hypoglycemics; but there was no statistical significance between berberine and oral hypoglycemics.

As for the treatment of hyperlipidemia, berberine with lifestyle intervention was better than lifestyle intervention alone, berberine with oral lipid lowering drugs was better than lipid lowering drugs alone in reducing the level of TC and LDL-C, and raising the level of HDL-C. In the comparative study between berberine and oral lipid lowering drugs, there was no statistical significance in reducing the level of TC and LDL-C, but berberine shows better effect in lowering the level of TG and raising the level of HDL-C.

In the treatment of hypertension, berberine with lifestyle intervention tended to lower the level of blood pressure more than the lifestyle intervention alone or placebo did; The same occurred when berberine combined with oral hypotensur was compared to the same hypotensur.

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Berberine Medicinal Uses

- This review highlighted that berberine effectively prevents the development of obesity through the modulation of gut microbiota, gene regulation, intestinal permeability and hepatic gluconeogenesis.

200 mg/kg to 1.0 g daily	reduces blood glucose
100 mg/kg to 500 mg/kg/day	modulates gut microbiota by elevating intestinal peptides such as GLP-1, GLP-2 and peptide YY and decreasing gastric inhibitory polypeptides
300 mg/kg/day	inhibits cholesterol and prevents formation of adipocytes
40 mg/kg to 380 mg/kg/day	inhibits hepatic gluconeogenesis
200 mg/kg/day	effective for intestine permeability and intestine epithelial junction

- Berberine is not only effective for obesity, but also for consequences of obesity such as diabetes and cancer.

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Urtica dioica
(Stinging Nettle)

- When administered 30 min before glucose loading, the aqueous extract of *Urtica dioica* (nettle) (250 mg/kg) showed a strong glucose lowering effect
 - Rats after first hour of eating
- Hypotensive
- 232 (81%) of 287 patients in the Urtica dioica group reported improved LUTS (Lower urinary tract symptoms) compared with (16%) in placebo

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Garlic (*Allium sativum*)

- A wide range of targets in the body:
 - Antibacterial
 - Antiviral against common cold
 - Anti-hypertensive
 - Hypolipidemic
 - Antioxidant
 - **Hypoglycemic**
 - Immunomodulatory
 - Anti-asthmatic
 - Anticarcinogenic



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Garlic proposed mechanisms

- Improved insulin secretion
- Increased insulin sensitivity
- Decreased FBG and HbA1c
- May reduce Islet Cell Antibodies against Beta cells of pancreas in T1DM
- Decreased intestinal glucose absorption
- Reduction in triglycerides, total cholesterol, LDL and increase in HDL
- Antioxidant effects

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A pilot study of D-chiro-inositol plus folic acid in overweight patients with type 1 diabetes.

- **Who:** Department of Endocrinology and Diabetes, University Campus Bio-Medico, Via Alvaro del Portillo Z1, 00128, Rome, Italy.
- **Objective:** The aim of this pilot study was to investigate the hypothesis that DCI plus folic acid may improve glucose control reducing insulin resistance in overweight or obese T1D patients
- **Methods:** A 24-week randomized control trial was carried out in 26 overweight or obese T1D patients, undergoing intensive insulin therapy. Patients were randomized to 1 g DCI plus 400 mcg folic acid once daily (treated group) or to 400 mcg folic acid only once daily (control group). The primary end point was to evaluate the efficacy of DCI on metabolic control as assessed by HbA1c
- **Results:** A significant reduction in HbA1c levels in treated group versus control group ($p < 0.05$) was observed
- **Conclusion:** This trial demonstrated for the first time that DCI plus folic acid oral supplementation can improve metabolic control in overweight T1D patients. CLINICALTRIAL.

5. Maurizi AR e. A pilot study of D-chiro-inositol plus folic acid in overweight patients with type 1 diabetes. - PubMed - NCBI. Ncbi.nlm.nih.gov. <https://www.ncbi.nlm.nih.gov/pubmed/28039583>. Published 2019. Accessed October 17, 2019.

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White Sesame Seed Oil Mitigates Blood Glucose Level, Reduces Oxidative Stress, and Improves Biomarkers of Hepatic and Renal Function in Participants with Type 2 Diabetes Mellitus

- **Who:** Department of Food Science and Human Nutrition, Faculty of Bio-Sciences , University of Veterinary and Animal Sciences , Lahore , Pakistan.
- **Objective:** The study was designed to investigate the impact of white sesame seed oil (WSSO) consumption on fasting blood glucose (GLU), insulin (INS), glycosylated hemoglobin (HbA1c),
- **Methods:** Forty-six participants with type 2 diabetes were recruited and randomly divided into two equal groups: diabetic control (DCON) and diabetic sesame oil (DSO). At baseline and 30, 60, and 90 days, blood samples were drawn and analyzed. Two-way repeated-measures analysis of variance was used to evaluate the difference between groups and across time.
- **Results:** In both groups, GLU, INS, and HbA1c were not significantly different at baseline . At 90 days, Fasting blood glucose (GLU) was significantly ($p < 0.05$) decreased in DSO when compared with DCON, while INS was significantly increased in DSO as compared to DCON . Also at 90 days, HbA1c was significantly lower ($p < 0.05$) in DSO as compared to DCON
- **Conclusion:** WSSO as a functional food may play an important role in GLU regulation and effects of diabetes in humans with type 2 diabetes

6. Ailam F e. White Sesame Seed Oil Mitigates Blood Glucose Level, Reduces Oxidative Stress, and Improves Biomarkers of Hepatic and Renal Function in Participant... - PubMed - NCBI. Ncbi.nlm.nih.gov. <https://www.ncbi.nlm.nih.gov/pubmed/30260748/>. Published 2019. Accessed October 17, 2019.

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Cinnamon

- Cinnamon is best known as a spice but the extracts from the bark of the cinnamon trees also has been used in traditional medicine
- Several small studies have linked cinnamon to help control blood sugar levels. Some of this work shows it may lower insulin resistance.



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Efficacy of cinnamon in patients with type II diabetes mellitus: A randomized controlled clinical trial

- **Who:** Diabetes Clinic of Yazd University of Medical Sciences
- **Objective:** This study was designed to investigate the effect of cinnamon supplementation on anthropometric, glycemic and lipid outcomes of patients with DM type II based on their baseline BMI.
- **Methods:** The study was designed as a triple-blind placebo-controlled randomized clinical trial, using a parallel design. 146 patients referred to Diabetes Clinic of Yazd University of Medical Sciences with diagnosis of DM type II were randomly assigned in four groups: cinnamon (BMI \geq 27, BMI < 27) and Placebo (BMI \geq 27, BMI < 27). Patients received cinnamon bark powder or placebo in 500 mg capsules twice daily for 3 months. Anthropometric, glycemic and lipid outcomes were measured before and after the intervention.
- **Results:** Cinnamon supplementation led to improvement of all anthropometric (BMI, body fat, and visceral fat), glycemic (FPG, Zhpp, Hb_{1c}, Fasting Insulin, and Insulin Resistance), and lipids (Cholesterol Total, LDL-c and HDL-c) outcomes (except for triglycerides level). All observed changes (except for Cholesterol Total and LDL-c) were significantly more prominent in patients with higher baseline BMI (BMI \geq 27).
- **Conclusion:** Based on the study findings, cinnamon may improve anthropometric parameters, glycemic indices and lipid profile of patients with type II diabetes. These benefits are significantly more prominent in patients with higher baseline BMI (BMI \geq 27).

7. Zare R, et al. Efficacy of cinnamon in patients with type II diabetes mellitus: A randomized controlled clinical trial. Clinical Nutrition. In press. Accessed Jan. 24, 2019.

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Alpha-Lipoic Acid

Alpha-lipoic acid is an antioxidant that is found in many foods, and it is also made in our bodies naturally.

Studies have suggested that Alpha-Lipoic Acid can help with neuropathy nerve damage due to diabetes. Patients have experienced reduced pain, tingling, and prickling in the feet and legs.

Recommended dose is between 600-1800 mg daily for diabetes and neuropathy.

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Efficacy and safety of high-dose α -lipoic acid in the treatment of diabetic polyneuropathy

- **Who:** Ruijin Hospital, Jiaotong University School of Medicine, Yuanyang Subdivision, Shanghai 200025, China
- **Objective:** To investigate the efficacy and safety of high-dose α -lipoic acid in the treatment of diabetic polyneuropathy with regards to sensory symptoms and nerve conduction velocity.
- **Methods:** A total of 236 diabetics with symptomatic polyneuropathy were enrolled into this 5-center, randomized, double-blind and placebo-controlled study of α -lipoic acid 1800 mg daily (n = 117) or matching placebo (n = 119) for 12 weeks. The primary outcome was total symptom score (TSS).
- **Results:** 73% patients with symptomatic polyneuropathy improved after treatment with α -lipoic acid for 12 weeks versus 18.2% with placebo. TSS decreased quickly after treatment with α -lipoic acid for 2 weeks (P < 0.05). And it was better than placebo. Individual symptom scores of pain, extremity numbness, burning sensation or resting abnormal sensations were significantly diminished as compared to those before treatment and placebo group (all P < 0.05).
- **Conclusion:** Oral treatment with high-dose α -lipoic acid for 12 weeks may improve symptoms in patients with diabetic polyneuropathy. Dose of 600 mg thrice daily for 2 weeks has marked effects with a reasonable safety.

8. Gu XM et al. [Efficacy and safety of high-dose α -lipoic acid in the treatment of diabetic polyneuropathy]. - Published - NCI. NCI. nlm.nih.gov. <https://www.ncbi.nlm.nih.gov/pubmed/21092474>. Published 2019. Accessed October 17, 2019.

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Diabetes & Nutrition

Patients with diabetes should receive individualized medical nutrition therapy (MNT). Various diets have been shown to provide benefit including:

- Plant-based diets (vegan)
- Diets lower in fat
- Low carbohydrate diets
- Mediterranean style diets

Nutrition Overview | ADA. Diabetes.org. <https://www.diabetes.org/nutrition>. Published 2019.

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Inflammation and Pain Labs

Lynn Lafferty

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Nutrition and Lifestyle Consultations

- **Paid by Medicare**
<https://www.Medicare.gov/coverage/nutrition-therapy-services>
 qualify to
 - "You pay nothing for these preventive services if you get them."
 - Your doctor may recommend you get services more Medicare covers.
 - You may have to pay some or all of the costs.

9/3/2009 Presentation Title 81

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Medical Nutrition Therapy (MNT)

- Medical nutrition therapy (MNT) is a key component of diabetes education and management. MNT is defined as a "nutrition-based treatment provided by a nutritionist."
- It includes "a nutrition diagnosis as well as therapeutic and counseling services to help manage diabetes."

9/3/2009 Presentation Title 82

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Medical Nutrition Therapy

1. AN INTENSIVE, FOCUSED, AND COMPREHENSIVE NUTRITION THERAPY SERVICE.
2. INVOLVES IN-DEPTH INDIVIDUALIZED NUTRITION ASSESSMENT.
3. RELIES HEAVILY ON FOLLOW-UP TO PROVIDE REPEATED REINFORCEMENT TO AID WITH BEHAVIOR CHANGE.
4. ESTABLISHES GOALS, A CARE PLAN, AND INTERVENTIONS.
5. PLANS FOR FOLLOW-UP OVER MULTIPLE VISITS TO ASSIST WITH BEHAVIORAL AND LIFESTYLE CHANGES RELATIVE TO EACH INDIVIDUAL'S NUTRITION PROBLEMS AND MEDICAL CONDITION OR DISEASE.

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Diabetes

- Are licensed or nationally registered health care professionals.
- Provide overall guidance related to all aspects of diabetes.
- Increase the person with diabetes's knowledge and skill about the disease.
- Promote self-care behaviors for effective self-management and glycemic control.

9/3/2009 Presentation Title 84

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WHAT YOU WANT TO REMOVE

- Ways “Food” Causes Disease
 - Trans-fat
 - High Fructose Corn Syrup
 - Artificial Sweeteners
 - MSG
 - Genetically Modified (GMO)
 - Salt
 - Chemical Additives

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WHAT YOU WANT TO REMOVE

- Ways “Food” Causes Disease
 - Trans-fat
 - High Fructose Corn Syrup
 - Artificial Sweeteners
 - MSG
 - Genetically Modified (GMO)
 - Salt
 - Chemical Additives

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Lifestyle Modifications

Manage weight

- Reducing weekly calorie intake to 3500 kcal will result in 11lbs weight loss

Be active

- 150 minutes of moderate intensity aerobic activity per week

Eat healthy

- Choosing whole , unprocessed foods over processed foods
- Non-starchy vegetables
- Limit or avoid foods with added sugar and refined foods
- Drink water instead of soda, diet soda or sugary drinks

Manage stress

- Yoga
- Meditation

Smoking cessation and alcohol

- Smoking is a risk factor for developing type 2 diabetes
- Drinking alcohol increases risk of hypoglycemia and should be consumed in moderation(≤ 1 drink/day for females and ≤ 2 drinks/day in men).

2. American Diabetes Association (ADA). Standards of Medical Care in Diabetes-2019. Diabetes Care. 2019; 42(suppl 1):S1-S193

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Glucose Index Foods

Moderate GI foods (56 to 69)

- Pita bread
- Brown rice
- Raisins
- Rye bread

High GI foods (70 and higher)

- White bread and bagels
- Processed cereals and instant oatmeal
- Potatoes
- White rice
- Honey
- Watermelon
- Pineapple

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Type 2 Treatment

First-line Treatment

- If A1C > 8.5%, start dual therapy
- If A1C > 10%, start insulin therapy

First-Line Treatment : Lifestyle Modifications + Metformin

If A1c not at target for 3-6 months, assess for ASCVD, CKD, OR HF

Add on Therapy

ASCVD(Atherosclerotic cardiovascular disease)

- Use drugs with proven CVD benefit:
- GLP-1 agonist: **Liraglutide, semaglutide, or exenatide**
- or
- SGLT2 inhibitors: **empagliflozin or canagliflozin**

HF or CKD

- Use SGLT2 inhibitors with proven HF or CKD benefit: **empagliflozin or canagliflozin**
- If SGLT2 inhibitors are CI or not tolerated, use GLP-1 agonist: **Liraglutide, semaglutide or exenatide**

2. American Diabetes Association (ADA). Standards of Medical Care in Diabetes-2019.Diabetes Care.2019; (suppl 1):S1-S193

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Incorporate Into Your Diet

- Fresh fruits and vegetables that have not been sprayed or grown in toxic conditions
- Organic should not be GMO
- Antioxidants are key
- Meats from animals raised properly in their natural habitats and treated humanely
- Fermented Foods which add good bacteria to your microbiome and make vitamins and remove toxins
- Foods which help the body to eliminate toxins
 - High Fiber
 - Facilitate Liver and Kidney Detoxification

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Healthy Diet

- 1,500-2,000 Calories
- Non-inflammatory
- Protein, Fats and Carbohydrates
- Fresh juices and water for hydration
- Glycation: attachment of a sugar to a **protein** or **lipid**
- Red blood cells have a consistent lifespan of 120 days and are accessible for measurement of **glycated hemoglobin**
 - **HbA1c**—the predominant form of glycated hemoglobin—enables medium-term blood sugar control to be monitored in **diabetes**.
- Glycation **cardiovascular diseases** (the endothelium, fibrinogen, and collagen are damaged), **Alzheimer's disease** (amyloid proteins)

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Types of Practices

Diet Counseling <ul style="list-style-type: none"> • Weight Loss • Weight Gain 	Diabetes and Obesity Counseling	MTM, Critical Care Management with nutritional component	IV Therapy <ul style="list-style-type: none"> • Work with doctor • Take certification for IV insertion
Functional Nutrition	Herbal Based Practices	Parenteral	Enteral

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CPT Codes

• The three most common medical nutrition therapy (MNT) codes

CPT, or Current Procedural Terminology, codes are the codes that identify the service you provided as a healthcare professional.

- **97802** – For an initial assessment, face-to-face
- **97803** – For a follow up visit or reassessment, face-to-face
- **97804** – For a group visit (2 or more individuals)
- When creating a superbill or filling out a CMS 1500 form, you will also have to specify the number of units and your fee per unit.
- Insurance billing is in units of 15 minutes each.
 - An 1-hour initial assessment is 4 units.
 - **When billing for telehealth services, DO NOT CHANGE CPT codes.**

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ICD-10 Diagnosis Codes

- ICD stands for "International Classification of Diseases."
- Codes are used by physicians and medical practitioners to assign medical diagnoses to individual patients. Pharmacists in Florida and dietitians cannot make medical diagnoses.

- **Common ICD-10 diagnosis codes you will see on referrals are:**
- **Z71.3** – Dietary counseling and surveillance (typically used for preventive services)
- **E11.____** –Type 2 Diabetes (the ____ specifies if any complications are present)
- **E66.0** – Obese due to excess calories
- **E66.3** – Overweight (weight management referrals)

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Telehealth

Telehealth Modifiers

- **GQ** – Asynchronous Telecommunications systems, such as a pre-recorded video
- **GT** – Interactive Audio and Video Telecommunications systems, including a live video conferencing session
- **G0** – Telehealth services for diagnosis, evaluation, or treatment, of symptoms of an acute stroke
- **95** – Synchronous Telemedicine Service Rendered Via a Real-Time Interactive Audio and Video Telecommunications system



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MNT Reimbursement Rates

- \$29-35 Initial 15 minutes
- 25-30 Subsequent 15 minutes
- \$15-18/30 min. group
- \$29-35 Changed dx initial

ICD-10 Code	Modifier	Rate
Z71.3		\$29-35
E11.0		\$29-35
E11.1		\$29-35
E11.2		\$29-35
E11.3		\$29-35
E11.4		\$29-35
E11.5		\$29-35
E11.6		\$29-35
E11.7		\$29-35
E11.8		\$29-35
E11.9		\$29-35
E66.0		\$29-35
E66.1		\$29-35
E66.2		\$29-35
E66.3		\$29-35
E66.4		\$29-35
E66.5		\$29-35
E66.6		\$29-35
E66.7		\$29-35
E66.8		\$29-35
E66.9		\$29-35

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