

Advanced Certificate in Ketogenic Diet

Ketone Metabolism in Disease

Acetone – a volatile ketone body produced from acetoacetate during hepatic ketogenesis. Related terms: Acetoacetate, β -Hydroxybutyrate. In the bloodstream it is rapidly cleared by the lungs and kidneys. Practical application: Breath acetone measurement serves as a non-invasive indicator of ketosis. Challenge: High ambient acetone can confound readings, requiring calibrated devices.

Acetoacetate – the primary ketone body synthesized from acetyl-CoA in mitochondria. Related terms: Acetone, β -Hydroxybutyrate. It can be reduced to β -hydroxybutyrate or spontaneously decarboxylate to acetone. Example: Elevated serum acetoacetate is a diagnostic marker in diabetic ketoacidosis (DKA). Challenge: Rapid interconversion with β -hydroxybutyrate complicates precise quantification.

β -Hydroxybutyrate – the most abundant circulating ketone, formed by reduction of acetoacetate via β -hydroxybutyrate dehydrogenase. Related terms: Acetoacetate, Acetone. Serves as an energy substrate for brain, heart, and skeletal muscle during carbohydrate restriction. Practical use: Intravenous β -hydroxybutyrate infusions are explored for neuroprotective therapy in traumatic brain injury. Challenge: Distinguishing therapeutic from pathological elevations requires context-specific thresholds.

AMP-activated protein kinase (AMPK) – a cellular energy sensor that is activated by increased AMP/ATP ratio. Related terms: mTOR, SIRT1. Activation promotes fatty-acid oxidation and ketogenesis while inhibiting anabolic pathways. Example: AMPK agonists (e.g., Metformin) enhance hepatic ketone production in low-carb diets. Challenge: Chronic AMPK activation may suppress protein synthesis, affecting muscle maintenance.

Alzheimer's disease (AD) – a neurodegenerative disorder characterized by amyloid- β plaques, tau tangles, and progressive cognitive decline. Related terms: Neuroinflammation, Mitochondrial dysfunction. Ketogenic diets aim to provide alternative fuel (β -hydroxybutyrate) to support neuronal metabolism and reduce oxidative stress. Practical application: Small-scale trials report improved memory scores after 12 weeks of a medium-chain triglyceride (MCT) diet. Challenge: Patient adherence and long-term safety data remain limited.

Alpers-Huttenlocher syndrome – a mitochondrial DNA depletion disorder causing refractory seizures, liver failure, and progressive neurodegeneration. Related terms: POLG mutations, Hepatic steatosis. Ketogenic therapy can exacerbate hepatic dysfunction due to increased fatty-acid flux. Example: Case reports advise cautious use of low-glycemic diets rather than strict ketosis. Challenge: Balancing seizure control with risk of worsening liver injury.

Amino acid catabolism – the breakdown of amino acids to generate intermediates for the TCA cycle and gluconeogenesis. Related terms: Gluconeogenesis, Nitrogen balance. In prolonged ketosis, branched-chain amino acids (leucine, isoleucine) are preferentially oxidized, providing anaplerotic substrates. Practical application: Monitoring plasma BCAA levels helps assess protein sparing during ketogenic therapy.

Challenge: Excessive protein loss may lead to sarcopenia in chronic disease.

Anaplerosis – the process of replenishing TCA-cycle intermediates that have been withdrawn for biosynthesis. Related terms: Cataplerosis, Citrate synthase. Ketone metabolism supplies acetyl-CoA without directly contributing to anaplerosis; therefore, supplemental anaplerotic substrates (e.G., Glutamine) are sometimes added to ketogenic formulas for patients with metabolic disorders. Example: In pyruvate carboxylase deficiency, anaplerotic support improves growth. Challenge: Balancing anaplerotic intake without disrupting ketosis.

Beta-oxidation – mitochondrial fatty-acid oxidation that generates NADH, FADH₂, and acetyl-CoA. Related terms: Carnitine shuttle, Acetyl-CoA. In ketogenic states, enhanced β -oxidation supplies the acetyl-CoA pool for ketogenesis. Practical use: Measuring acyl-carnitine profiles helps detect defects in β -oxidation that could precipitate ketoacidosis. Challenge: Medium-chain fatty acids bypass the carnitine shuttle, which may mask underlying transport defects.

Brain-derived neurotrophic factor (BDNF) – a protein that supports neuronal survival, differentiation, and synaptic plasticity. Related terms: Neuroplasticity, TrkB receptor. Ketone bodies up-regulate BDNF expression via histone deacetylase inhibition. Example: Rodent models of epilepsy show reduced seizure frequency when BDNF levels rise after a ketogenic diet. Challenge: Translating pre-clinical BDNF modulation to human therapeutic outcomes requires precise dosing and timing.

Carbohydrate-restricted diet – a nutritional regimen limiting carbohydrate intake to ≤ 50 g per day, often used to induce ketosis. Related terms: Ketogenic diet, Low-glycemic index. Provides the metabolic milieu for hepatic ketogenesis while preserving lean mass through adequate protein. Practical application: Dietitians tailor macronutrient ratios (e.G., 4:1 Fat to protein+carb) for pediatric epilepsy. Challenge: Risk of micronutrient deficiencies necessitates supplementation protocols.

Carnitine deficiency – a condition impairing the transport of long-chain fatty acids into mitochondria, leading to reduced β -oxidation and ketone production. Related terms: Primary carnitine deficiency, Secondary carnitine deficiency. Patients on ketogenic diets may develop secondary deficiency due to increased demand. Example: Supplementation with L-carnitine improves fatty-acid oxidation and stabilizes ketone levels. Challenge: Over-supplementation can cause gastrointestinal upset and interfere with certain anticonvulsants.

Cerebral glucose hypometabolism – reduced uptake and utilization of glucose by brain tissue, observed in early Alzheimer's and some mitochondrial diseases. Related terms: FDG-PET, Metabolic flexibility. Ketone bodies act as an alternative fuel, partially compensating for glucose deficits. Practical use: ^{13}C -ketone PET imaging quantifies cerebral ketone utilization in clinical trials. Challenge: Individual variability in transporter expression (MCT1, MCT2) influences therapeutic response.

Coenzyme Q10 (CoQ10) – an essential component of the electron transport chain and a potent antioxidant. Related terms: Mitochondrial respiration, Oxidative stress. Ketogenic diets may increase oxidative load; adjunctive CoQ10 supplementation can support mitochondrial efficiency. Example: Children with mitochondrial encephalopathy showed improved seizure control when CoQ10 was added to a ketogenic

regimen. Challenge: Bioavailability of CoQ10 is low; lipid-based formulations are required for optimal absorption.

Creatine kinase (CK) elevation – a laboratory finding indicating muscle membrane leakage or rapid turnover. Related terms: Rhabdomyolysis, Muscle catabolism. In some patients on high-fat diets, transient CK rises occur due to increased reliance on fatty acids for muscle energy. Practical application: Routine CK monitoring helps detect early muscle injury. Challenge: Distinguishing diet-related CK changes from drug-induced rhabdomyolysis (e.g., Statins) demands careful clinical correlation.

Diabetic ketoacidosis (DKA) – a life-threatening complication of uncontrolled type 1 diabetes characterized by hyperglycemia, acidosis, and high ketone levels. Related terms: Hyperosmolar state, Insulin deficiency. While therapeutic ketosis is controlled, DKA represents uncontrolled ketogenesis. Example: Protocol-driven insulin infusion reduces ketone production by suppressing lipolysis. Challenge: Educating patients on the distinction between nutritional ketosis (10 mmol/L) is essential for safe self-management.

Electron transport chain (ETC) – a series of protein complexes (I-IV) that generate ATP through oxidative phosphorylation. Related terms: NADH, FADH₂. B-Hydroxybutyrate oxidation yields NADH, feeding electrons into Complex I, while acetyl-CoA from ketones fuels the TCA cycle. Practical use: Measuring oxygen consumption rate (OCR) in cultured neurons reveals the efficiency of ketone-derived ATP production. Challenge: ETC dysfunction in mitochondrial disease limits the benefit of ketone supplementation.

Epilepsy – a neurological disorder characterized by recurrent, unprovoked seizures. Related terms: GABAergic inhibition, Neuroexcitability. The classic indication for the ketogenic diet; ketone bodies enhance GABA synthesis and reduce neuronal firing. Example: A 3-month prospective study showed >50% seizure reduction in 30% of participants on a 4:1 Diet. Challenge: Diet adherence, growth retardation, and dyslipidemia are common adverse effects in pediatric cohorts.

Fatty-acid synthase (FAS) – an enzyme complex catalyzing de novo lipogenesis from acetyl-CoA. Related terms: Lipogenesis, Acetyl-CoA carboxylase. In ketosis, hepatic FAS activity is suppressed, decreasing triglyceride synthesis. Practical application: Measuring serum malonyl-CoA serves as a proxy for FAS activity. Challenge: In insulin-resistant patients, residual FAS activity may contribute to hepatic steatosis despite ketosis.

Glucose-dependent insulintropic polypeptide (GIP) – an incretin hormone released from K-cells in response to nutrient ingestion. Related terms: GLP-1, Incretin effect. Low carbohydrate intake reduces GIP secretion, which may alter insulin dynamics. Example: Diminished GIP levels are observed in patients on a strict ketogenic diet, correlating with lower postprandial insulin spikes. Challenge: Reduced GIP may affect bone turnover, necessitating monitoring of bone mineral density.

Glucose-6-phosphate dehydrogenase (G6PD) deficiency – a hereditary enzymopathy that impairs the pentose phosphate pathway, increasing susceptibility to oxidative stress. Related terms: Hemolysis, NADPH. Ketogenic diets raise mitochondrial NADH/NAD⁺ ratios, potentially exacerbating oxidative stress in G6PD-deficient individuals. Practical approach: Avoid high-dose vitamin C supplements and monitor hemoglobin levels. Challenge: Limited data on long-term ketogenic therapy in this population.

Glutamate-glutamine cycle – a neuronal-astrocytic exchange that recycles the excitatory neurotransmitter glutamate. Related terms: Neurotransmitter turnover, Astrocyte metabolism. Ketone bodies increase astrocytic uptake of glutamate, reducing excitotoxicity. Example: In mouse models of epilepsy, β -hydroxybutyrate treatment normalizes extracellular glutamate concentrations. Challenge: Quantifying in vivo cycle flux requires invasive microdialysis techniques.

Glutathione (GSH) – the chief intracellular antioxidant, maintaining redox balance. Related terms: Oxidative stress, NADPH. Ketogenic diets can elevate GSH levels by providing acetyl-CoA for cysteine synthesis. Practical use: Measuring GSH/GSSG ratio in blood serves as a biomarker for oxidative status in patients on a ketogenic regimen. Challenge: Inadequate intake of sulfur-containing amino acids may limit GSH synthesis, requiring dietary adjustment.

Hepatic steatosis – accumulation of triglycerides in liver cells, commonly termed fatty liver. Related terms: Non-alcoholic fatty liver disease (NAFLD), VLDL secretion. Short-term ketogenic diets often reduce hepatic fat by enhancing β -oxidation; however, chronic high-fat intake without adequate carbohydrate may worsen steatosis in susceptible individuals. Example: Imaging studies show a 15% reduction in liver fat after 8 weeks of a 3:1 Diet in obese adults. Challenge: Monitoring liver enzymes and imaging is essential to avoid progression to steatohepatitis.

Insulin resistance – a condition in which cells exhibit diminished responsiveness to insulin, leading to hyperinsulinemia. Related terms: Metabolic syndrome, HOMA-IR. Ketogenic diets improve insulin sensitivity by lowering circulating glucose and reducing ectopic lipid deposition. Practical application: Oral glucose tolerance tests (OGTT) before and after a 12-week ketogenic protocol demonstrate decreased area-under-the-curve (AUC). Challenge: Individual variability; some patients experience transient insulin spikes after re-introduction of carbs.

Ketone body transporter (MCT) – monocarboxylate transporters (MCT1-4) that facilitate cellular uptake of ketones and lactate. Related terms: SLC16A1, Blood-brain barrier. Up-regulation of MCT2 in neurons enhances β -hydroxybutyrate utilization during ketosis. Example: PET studies reveal increased MCT expression in the hippocampus of patients on a ketogenic diet. Challenge: Genetic polymorphisms in SLC16A genes may limit therapeutic efficacy in certain individuals.

Ketogenic diet (KD) – a high-fat, low-carbohydrate, moderate-protein nutritional plan designed to induce nutritional ketosis. Related terms: Classic KD, Modified Atkins diet, Low-glycemic index diet. Used for refractory epilepsy, metabolic disorders, and as an adjunct in cancer therapy. Practical aspect: Dietitians calculate gram-for-gram macronutrient ratios to achieve target β -hydroxybutyrate levels (2-4 mmol/L). Challenge: Long-term adherence, growth monitoring in children, and dyslipidemia require multidisciplinary oversight.

Ketone-induced signaling – the ability of β -hydroxybutyrate to act as a signaling molecule, modulating gene expression and inflammation. Related terms: Histone deacetylase (HDAC) inhibition, NLRP3 inflammasome. β -Hydroxybutyrate inhibits class I HDACs, leading to up-regulation of antioxidant genes such as FOXO3. Example: In models of cardiac ischemia, ketone signaling reduces infarct size. Challenge: Dose-dependent effects; supraphysiologic concentrations may blunt beneficial signaling pathways.

Lactate dehydrogenase (LDH) – an enzyme interconverting pyruvate and lactate, reflecting cellular redox status. Related terms: Anaerobic glycolysis, NAD⁺/NADH ratio. In ketosis, reduced glycolytic flux lowers LDH activity, decreasing lactate production. Practical use: Serum LDH trends can help differentiate metabolic acidosis due to ketones versus lactic acidosis. Challenge: Co-existing tissue injury (e.G., Myocardial infarction) can obscure interpretation.

Medium-chain triglyceride (MCT) oil – a fat source rich in C8-C10 fatty acids that are rapidly absorbed and converted into ketone bodies. Related terms: Caprylic acid, Capric acid. Used to augment ketone production without strict carbohydrate restriction. Example: Children with refractory epilepsy often achieve therapeutic β -hydroxybutyrate levels with 10–15 % of total calories from MCT oil. Challenge: Gastrointestinal intolerance (cramping, diarrhea) may limit dose escalation.

Metabolic flexibility – the capacity of cells to switch between carbohydrate and fat oxidation based on substrate availability. Related terms: Randle cycle, Fuel preference. Ketogenic diets enhance metabolic flexibility by training mitochondria to oxidize fatty acids efficiently. Practical assessment: Respiratory exchange ratio (RER) measurements during graded exercise reveal shifts toward fat utilization. Challenge: In insulin-resistant patients, flexibility may be blunted, requiring prolonged adaptation periods.

Mitochondrial DNA (mtDNA) depletion syndrome – a group of inherited disorders characterized by reduced mtDNA copy number, leading to impaired oxidative phosphorylation. Related terms: POLG, DGUOK. Ketogenic therapy can provide alternative substrates (ketones) that bypass certain complex-I defects. Example: A case series reported improved motor function in children with POLG mutations after 6 months of a 3:1 KD. Challenge: Monitoring for hepatic toxicity, as some mtDNA disorders predispose to liver failure under high-fat diets.

mTOR signaling pathway – a central regulator of cell growth, protein synthesis, and autophagy, responsive to nutrient status. Related terms: AMPK, Rapamycin. Ketogenic diets suppress mTOR activity via reduced insulin and amino-acid signaling, promoting autophagy and potentially mitigating neurodegeneration. Practical use: Measuring phosphorylated-S6K levels in peripheral blood mononuclear cells serves as a surrogate for mTOR activity. Challenge: Chronic mTOR inhibition may impair wound healing and muscle hypertrophy.

Neuroinflammation – activation of glial cells and release of pro-inflammatory cytokines within the central nervous system. Related terms: IL-1 β , TNF- α . B-Hydroxybutyrate attenuates neuroinflammation by inhibiting the NLRP3 inflammasome. Example: Rodent models of traumatic brain injury show reduced IL-1 β expression after a 2-week ketogenic regimen. Challenge: Translating cytokine reductions to functional neurological outcomes in humans remains an active research area.

Oxidative phosphorylation (OXPHOS) – the mitochondrial process that synthesizes ATP using the proton gradient generated by the ETC. Related terms: ATP synthase, Proton motive force. Ketone oxidation yields a higher P/O ratio compared with fatty-acid oxidation, improving energetic efficiency. Practical application: High-resolution respirometry demonstrates increased OXPHOS capacity in skeletal muscle biopsies after 4 weeks of a ketogenic diet. Challenge: Patients with complex-III deficiencies may not experience this efficiency gain.

Palmitic acid – a long-chain saturated fatty acid (C16:0) Commonly found in animal fats. Related terms: Saturated fatty acids, Lipotoxicity. Excessive intake can promote hepatic insulin resistance, counteracting benefits of ketosis. Example: Diet formulations that limit palmitic acid to Peroxisome proliferator-activated receptor α (PPAR α) – a nuclear receptor that regulates genes involved in fatty-acid oxidation and ketogenesis. Related terms: PPAR γ , Fibrates. Activation of PPAR α by endogenous fatty-acid ligands enhances hepatic ketone production. Practical use: Fibrate drugs (e.G., Fenofibrate) may synergize with ketogenic diets to increase β -hydroxybutyrate levels. Challenge: Drug-diet interactions can raise the risk of myopathy, necessitating creatine kinase monitoring.

Phosphatidylcholine (PC) – a major phospholipid component of cell membranes, synthesized via the Kennedy pathway using choline. Related terms: Lipidomics, Membrane fluidity. Ketogenic diets rich in choline-containing foods (egg yolk, liver) support PC synthesis, preserving neuronal membrane integrity. Example: Patients with fatty-acid oxidation disorders benefit from choline supplementation alongside a KD. Challenge: Excessive choline may lead to trimethylamine N-oxide (TMAO) elevation, a potential cardiovascular risk factor.

Pyruvate dehydrogenase complex (PDH) deficiency – a mitochondrial enzyme disorder that impairs conversion of pyruvate to acetyl-CoA, leading to lactic acidosis. Related terms: Lactate, Ketogenic therapy. Providing ketone bodies circumvents the PDH block, supplying acetyl-CoA directly to the TCA cycle. Example: Infants with PDH deficiency exhibit improved developmental scores after 3 months on a ketogenic diet. Challenge: Careful monitoring of acid-base status is required to avoid metabolic decompensation.

Reactive oxygen species (ROS) – chemically reactive molecules derived from oxygen, such as superoxide and hydrogen peroxide. Related terms: Antioxidant defense, NADPH oxidase. Ketone metabolism can both increase NADH production (potentially raising ROS) and activate antioxidant pathways (e.G., Nrf2). Practical approach: Measuring plasma F2-isoprostanes provides an index of lipid peroxidation during ketogenic therapy. Challenge: Balancing ROS signaling required for cellular adaptation against harmful oxidative damage.

Renal stone formation – the development of kidney calculi, often calcium oxalate or uric acid types. Related terms: Hypercalciuria, Acidic urine. High dietary fat can increase urinary calcium excretion; low urinary pH from ketonuria predisposes to uric acid stones. Example: Prophylactic potassium citrate supplementation reduces stone risk in adults on a long-term KD. Challenge: Regular ultrasound surveillance is necessary, especially in pediatric patients.

Reye's syndrome – a rare, acute encephalopathy associated with viral infections and aspirin use, characterized by hepatic dysfunction and cerebral edema. Related terms: Mitochondrial toxicity, Aspirin contraindication. Ketogenic diets have been investigated as supportive therapy due to their neuroprotective properties. Practical note: Avoidance of aspirin is mandatory when employing a KD in children at risk. Challenge: Limited clinical data restrict definitive recommendations.

Riboflavin (Vitamin B2) deficiency – a deficiency that impairs flavin-adenine-dinucleotide (FAD)-dependent enzymes, including acyl-CoA dehydrogenases. Related terms: FAD, Flavoproteins. Insufficient riboflavin can blunt β -oxidation, reducing ketone production. Example: Supplementation of 10 mg riboflavin daily restored

normal acyl-carnitine profiles in patients on a KD with prior fatty-acid oxidation lag. Challenge: High-dose riboflavin may cause yellow-orange urine, which can be mistaken for ketonuria.

Seizure threshold – the level of neuronal excitability at which a seizure is triggered. Related terms: GABAergic tone, Membrane potential. Ketone bodies raise the seizure threshold by enhancing GABA synthesis and stabilizing neuronal membranes. Practical use: EEG monitoring before and after KD initiation quantifies changes in epileptiform activity. Challenge: Individual variability means some patients require adjunctive antiepileptic drugs despite diet therapy.

Serum electrolytes – concentrations of sodium, potassium, chloride, and bicarbonate measured in blood. Related terms: Fluid balance, Acid-base status. Ketogenic diets can cause electrolyte shifts due to diuresis and acid excretion. Example: Routine monitoring of serum potassium prevents hypokalemia, which can precipitate cardiac arrhythmias. Challenge: Balancing fluid restriction in patients with heart failure while maintaining adequate electrolyte replacement.

Short-chain fatty acids (SCFA) – fatty acids with ≤ 6 carbon atoms, produced by colonic bacterial fermentation of dietary fiber. Related terms: Butyrate, Gut microbiome. SCFAs influence systemic metabolism and may modulate ketone production indirectly via gut-brain signaling. Practical application: Inclusion of modest fiber (e.g., Psyllium) in a KD preserves SCFA generation without compromising ketosis. Challenge: Excessive fiber can increase gastrointestinal symptoms and interfere with fat absorption.

Sodium-glucose cotransporter-2 (SGLT2) inhibitors – a class of antihyperglycemic agents that promote glucosuria. Related terms: Euglycemic ketoacidosis, Empagliflozin. When combined with low-carbohydrate diets, SGLT2 inhibitors increase the risk of euglycemic ketoacidosis due to enhanced lipolysis. Example: Patient education programs advise discontinuation of SGLT2 therapy before initiating a strict KD. Challenge: Balancing cardiovascular benefits of SGLT2 inhibition against ketoacidosis risk requires individualized risk assessment.

Starvation ketosis – the physiological increase in ketone bodies during prolonged fasting (>24 h). Related terms: Gluconeogenesis, Lipolysis. Unlike nutritional ketosis, starvation ketosis may be accompanied by muscle protein breakdown. Practical distinction: Measurement of urinary nitrogen excretion helps differentiate the two states. Challenge: Prolonged fasting in disease states (e.g., Cancer cachexia) can exacerbate malnutrition.

Thyroid hormone metabolism – the conversion of T4 to active T3 and reverse T3 (rT3). Related terms: Deiodinases, Basal metabolic rate. Ketogenic diets may reduce peripheral conversion of T4 to T3, leading to lower serum T3 levels. Example: Monitoring free T3 in patients on a KD helps detect clinically relevant hypothyroidism. Challenge: Distinguishing diet-induced changes from primary thyroid disease requires comprehensive endocrine evaluation.

Tricarboxylic acid (TCA) cycle – the central mitochondrial pathway that oxidizes acetyl-CoA to CO_2 and generates NADH/FADH₂. Related terms: Citrate synthase, Anaplerosis. Ketone-derived acetyl-CoA enters the TCA cycle, providing a high-energy substrate while sparing glucose. Practical measurement: ^{13}C -labeled β -hydroxybutyrate infusion tracks TCA flux in vivo. Challenge: In certain inborn errors (e.g., Fumarase

deficiency), TCA capacity is limited, reducing the benefit of ketone supplementation.

Uric acid nephropathy – kidney injury caused by precipitation of uric acid crystals in renal tubules. Related terms: Hyperuricemia, Acidic urine. Increased ketone excretion can lower urinary pH, favoring uric acid stone formation. Example: Allopurinol prophylaxis reduces incidence of nephropathy in patients on a high-fat diet with a history of gout. Challenge: Monitoring serum uric acid and urine pH is essential during diet initiation.

Valproic acid (VPA) therapy – an anticonvulsant medication that can interfere with fatty-acid oxidation. Related terms: Mitochondrial toxicity, Hepatotoxicity. VPA may blunt ketone production, necessitating higher fat ratios or adjunctive MCT oil to achieve therapeutic ketosis. Practical approach: Serial liver function tests and ketone monitoring guide dose adjustments. Challenge: Risk of VPA-induced hepatotoxicity is heightened when combined with high-fat diets, especially in young children.

Vitamin D status – the concentration of 25-hydroxyvitamin D in serum, reflecting skeletal health and immune function. Related terms: Calcium absorption, Bone mineral density. Ketogenic diets can reduce vitamin D intake due to limited dairy consumption. Example: Supplementation of 1000 IU vitamin D daily prevented hypocalcemia in pediatric KD patients. Challenge: Monitoring for hypercalciuria is required, as excess vitamin D may exacerbate renal stone risk.

Wernicke's encephalopathy – an acute neuropsychiatric syndrome caused by thiamine (Vitamin B1) deficiency, presenting with ophthalmoplegia, ataxia, and confusion. Related terms: Alcoholism, Malnutrition. Strict ketogenic diets may limit thiamine-rich foods (whole grains, legumes). Practical prophylaxis: Administer 100 mg thiamine intravenously before initiating a KD in high-risk patients. Challenge: Early detection is critical, as delayed treatment leads to irreversible brain damage.