

JANUARY
2023

INTRODUCTION TO FUNCTIONAL PSYCHIATRY: FOUNDATIONAL LAB TESTING & CORE CONCEPTS

Mental health clinicians today stand at a crossroads linking biology and psychology, research and practice, tradition and innovation. While the march of scientific progress marches ever onwards, shedding new light on the biological foundations of neuropsychiatric illness, mainstream psychiatry has devoted relatively little effort towards bridging research innovation and methodology. Worse, traditional symptom-drug models are still heavily prioritized in mainstream settings despite overwhelming evidence of their inadequacy. For too many patients and providers, psychiatry remains a “measureless medicine.”

Functional Psychiatry offers an empirically validated rebuttal to this status quo. A specialized field of systems biology, Functional Psychiatry is characterized by a focus on biology as the “language” through which internal and external factors interact to produce a continuum of neurologic health or disease. As such, it allows for a highly focused approach – one based on objective biomedical analyses that permit the custom-tailoring of therapeutic protocols.

While rationales for the inclusion of biomedical testing are easily understood, bridging concept and application can be challenging. *What tests are appropriate for which patients? What tests offer the most useful data? How does one negotiate standardization vs. biochemical individuality?*

This module will establish a critical foundation upon which Fellows may begin to bridge research, methodology, and application for their practices. It will present key tenets of Functional Medicine, illuminating avenues for the integration of Functional strategies into existing protocols. Practical considerations will be discussed alongside conceptual ideals, emphasizing the role that clinical judgment should play in the decision-making that drives a successful Functional Psychiatry practice.

The module will also present laboratory tests that, alongside a psychiatric assessment and intake exam, comprise a foundational testing battery - from which treatment plans may then be developed in accordance with a scientific, ethical, conscientious paradigm of care.

RECOMMENDED READINGS

- ❖ Greenblatt J. A Note on Functional Medicine Biomedical Assessment.
- ❖ Greenblatt, J. *Integrative Medicine for Depression* (excerpt) – Chapter 16. Laboratory Testing.
- ❖ Braun LT, et al. Guessing right - whether and how medical students give incorrect reasons for their correct diagnoses. *GMS J Med Educ.* 2019;36(6):Doc85.
- ❖ Greenblatt, J. *Functional Medicine for Antidepressant Withdrawal* (excerpt)
- ❖ Functional Medicine Lab Testing – Ordering Information

FEBRUARY
2023

FUNCTIONAL & INTEGRATIVE MEDICINE FOR DEPRESSION

Depression accounts for more disability than any other health condition and is linked to the highest global suicide rate in history. Labeling this phenomenon a “crisis” is congruent with the body of research demonstrating that rates of depressive illness are increasing worldwide. Of equal concern, rates are increasing in spite of the fact that traditional psychiatry possesses a well-established treatment model – one based on symptomatic suppression and heavily reliant upon pharmaceutical intervention.

It is clear the traditional treatment model is inadequate. Depression remission rates, even with the newest medications, remain poor, and a significant percentage of patients taking medication suffer from unresolved symptoms. *We can do better.*

Research confirms that depression etiology is highly complex. Powerful evidence supports that depression is moderated by underlying metabolic abnormalities, genetic susceptibilities, and psychosocial factors, all of which can impact neurologic health through a variety of biologic pathways. Similarly, imbalances of essential micronutrients can alter brain function, and have been linked to a variety of psychiatric pathologies. . . including depression. Depression thus invites an integrated approach that encompasses psychology and biology, coalescing a complete paradigm of care.

This module presents a Functional Medicine model in which the concept of depression as the result of underlying biochemical, genetic, and environmental factors is explored. Fact will be separated from fiction as the module shines an objective spotlight on mental healthcare today – the good, the bad, and the opportunities for change.

Research revealing robust associations between metabolic disturbances, nutrient deficiencies, and psychosocial influences will be reviewed. Additional research illustrating the benefits of nutritional augmentation to optimize brain function will be explored; evidence-based interventions will be described; and a treatment approach centered upon objective biologic measurement and biochemical individuality will be presented.

RECOMMENDED READINGS

- ❖ Greenblatt J. Psychiatry Redefined: integrative medicine for depression. Townsend Letter.
- ❖ Vellekkatt F, Menon V. Efficacy of vitamin D supplementation in major depression: A meta-analysis of randomized controlled trials. *J Postgrad Med.* 2019;65(2):74-80.
- ❖ Laird E, et al. Low vitamin B12 but not folate is associated with incident depressive symptoms in community-dwelling older adults: a 4 year longitudinal study. *Br J Nutr.* 2021;1-22.
- ❖ Wang J, Um P, Dickerman BA, Liu J. Zinc, Magnesium, Selenium and Depression: A Review of the Evidence, Potential Mechanisms and Implications. *Nutrients.* 2018;10(5):584.
- ❖ Liao Y, et al. Efficacy of omega-3 PUFAs in depression: A meta-analysis. *Transl Psychiatry.* 2019;9(1):190.

MARCH
2023

FUNCTIONAL & INTEGRATIVE MEDICINE FOR ANXIETY

This module provides a comprehensive introduction to a Functional Medicine model for the treatment of anxiety disorders. Following an empirically substantiated rationale for the de-prioritization of symptom classification, and a step away from psychopharmacology, the viability of a Functional approach will be elucidated through reviews of studies showing anxiety to be associated with nutritional deficiencies, neurotransmitter dysfunction, inflammation, and other endogenous factors. The mechanisms through which these factors impact cognition and behavior will be explored, with an emphasis on the practical ramifications of biochemical individuality.

In addition to generalized anxiety, the module will also shine a focused spotlight on obsessive compulsive disorder (OCD) – a potentially debilitating illness for which the mainstream therapeutic arsenal is limited, often administered per a traditional “trial & error” model, and associated with high rates of treatment failure. Considerations of biologic etiology are typically absent from such models, too, despite growing evidence of discrete contributors such as genetics, inflammation, gut dysbiosis, and – notably – serotonergic dysfunction.

In line with a Functional Medicine model, this module will review research evidence corroborating biological contributors to OCD that open novel avenues for targeted treatment.

This approach joins the latest in biomedical analysis with personalized medicine to address the biological, psychological, and environmental factors that contribute to the emergence or entrenchment of OCD. By implementing personalized Functional Psychiatry interventions designed to target such underlying causes, it moves patients beyond symptom suppression and into recovery with confidence. . . setting them along a stable path towards lasting healing.

RECOMMENDED READINGS

- ❖ Greenblatt J. Integrative therapies for obsessive compulsive disorder. 2019.
- ❖ Noah L, et al. Effect of magnesium and vitamin B6 supplementation on mental health and quality of life in stressed healthy adults: post-hoc analysis of a randomised controlled trial. *Stress Health*. 2021;37(5):1000-1009.
- ❖ Aylett E, et al. Exercise in the treatment of clinical anxiety in general practice - a systematic review and meta-analysis. *BMC Health Serv Res*. 2018;18(1):559.
- ❖ Ooi SL, Green R, Pak SC. N-Acetylcysteine for the Treatment of Psychiatric Disorders: A Review of Current Evidence. *Biomed Res Int*. 2018;2018:2469486.
- ❖ Kayser RR, et al. Acute effects of cannabinoids on symptoms of obsessive-compulsive disorder: A human laboratory study. *Depress Anxiety*. 2020;37(8):801-811.

APRIL 2023

FUNCTIONAL & INTEGRATIVE MEDICINE FOR ADHD

Scientific evidence confirms ADHD to be a neurologic, brain-based disorder represented by numerous biological abnormalities. What is observable as atypical behavior is merely the tip of an iceberg that extends down to an individual's unique biochemical makeup. Certain nutritional imbalances, which can profoundly impact cognition and behavior, are significantly correlated with this common disorder. Diet, micronutrient status, and individual biochemistry, however, are frequently overlooked or excluded from "typical" ADHD assessment and treatment protocols.

Fortunately, addressing nutritional imbalances with a Functional Medicine approach has proven effective in treating ADHD.

This module introduces the Plus/Minus Plan for ADHD and provides a comprehensive overview of the biochemistry "beneath" the disorder. Dietary interventions and augmentation strategies for the mitigation of specific nutrient deficiencies will be reviewed, as well as recommendations for going "beyond biochemistry" to enhance treatment outcomes.

RECOMMENDED READINGS

- ❖ Greenblatt J. Finally Focused - Mineral Imbalances and ADHD. Parts I and II. 2017.
- ❖ Greenblatt et al. OPCs for the treatment of Attention-Deficit Hyperactivity Disorder. *The Neuropsychotherapist*. <https://www.thescienceofpsychotherapy.com/the-neuropsychotherapist-issue-5-volume-5/>. Published 2017.
- ❖ Arbuckle TE, Davis K, Boylan K, Fisher M, Fu J. Bisphenol A, phthalates and lead and learning and behavioral problems in Canadian children 6-11 years of age: CHMS 2007-2009. *Neurotoxicology*. 2016;54:89-98.
- ❖ El Baza et al. Magnesium supplementation in children with attention deficit hyperactivity disorder. *Egypt J Med Hum Gen*. 2016;17(1):63-70.
- ❖ Harding KL, et al. Outcome-Based Comparison of Ritalin® versus Food-Supplement Treated Children with ADHD. *Altern Med Rev*. 2003 Aug;8(3):319-30.

MAY
2023

FUNCTIONAL & INTEGRATIVE MEDICINE FOR ADDICTION

This module elucidates a comprehensive Functional Medicine approach to the treatment of substance use disorders (SUDs), targeting reward-pathway dysregulation and the many nutritional deficiencies associated with addiction that can alter brain function and further entrench or amplify addiction.

Integrating mainstream approaches such as MAT and psychotherapy with evidence-based Functional Medicine approaches such as nutrient therapy, acupuncture, and mindfulness, this module provides clinicians with a roadmap for navigating disorders of addiction and bringing patients into balance.

RECOMMENDED READINGS

- ❖ Blum K et al. Neuronutrient amino-acid therapy protects against reward deficiency syndrome: dopaminergic key to homeostasis and neuroplasticity. *Curr Pharm Des.* 2016;22(38):5837- 5854.
- ❖ Ham BJ, Choi IG. Psychiatric implications of nutritional deficiencies in alcoholism. *Psychiatry Investig.* 2005;2(2):44-59.
- ❖ Meckel KR, Kiraly DD. A potential role for the gut microbiome in substance use disorders. *Psychopharmacology (Berl).* 2019 May;236(5):1513-1530.
- ❖ Narasimha VL et al. Pellagra and alcohol dependence syndrome: findings from a tertiary care addiction treatment centre in India. *Alcohol Alcohol.* 2019 Mar 1;54(2):148-151.
- ❖ Chang CT, Hsieh PJ, Lee HC, Lo CH, Tam KW, Loh EW. Effectiveness of N-acetylcysteine in Treating Clinical Symptoms of Substance Abuse and Dependence: A Meta-analysis of Randomized Controlled Trials. *Clin Psychopharmacol Neurosci.* 2021;19(2):282-293.

JUNE
2023

HORMONES

Individuals the world over tend to associate “hormones” with two things: human sexuality and reproduction; and the often-awkward physical and emotional changes of adolescence. This analysis, though limited, hints at the bigger picture of hormones by recognizing that these endogenous molecules are capable of influencing body *and* mind.

Over the past several decades, science has pulled back the curtain on the pleiotropic actions of hormones, yielding a more nuanced understanding of the ways in which hormones influence brain, behavior, and mood. Estrogen, for example, once thought of as relevant only to female reproductive systems, has been revealed as powerfully neuroactive. The ubiquitous stress hormone cortisol is now implicated in the pathogenesis of several psychiatric disorders, having been shown to contribute to neural degradation and inflammatory cascades. And the diminutive thyroid gland has been illuminated as a potentially significant etiologic contributor to depressive disorders.

This module will place hormones under a focused spotlight, delving into empirical evidence that corroborates the vital place these signaling molecules merit within the Functional Medicine repertoire. Research supporting associations between hormones, neuroendocrine dysfunction, and various psychiatric manifestations will be explored, with a focus on underlying mechanisms. Evidence-based strategies for testing and hormonal rebalancing will also be presented, expanding the therapeutic toolbox available to Fellows who seek to implement comprehensive, multifaceted protocols for personalized healing.

RECOMMENDED READINGS

- ❖ Nuguru SP, et al. Hypothyroidism and Depression: A Narrative Review. *Cureus*. 2022;14(8):e28201. Published 2022 Aug 20. doi:10.7759/cureus.28201
- ❖ Gersh FL, Lavie CJ. Menopause and hormone replacement therapy in the 21st century *Heart*. 2020;6(7):479-481.
- ❖ Jett S, et al. Ovarian steroid hormones: A long overlooked but critical contributor to brain aging and Alzheimer's disease. *Front Aging Neurosci*. 2022;14:948219.
- ❖ Ratner MH, Kumaresan V, Farb DH. Neurosteroid Actions in Memory and Neurologic/Neuropsychiatric Disorders. *Front Endocrinol (Lausanne)*. 2019;10:169.
- ❖ Saito K, Cui H. Emerging Roles of Estrogen-Related Receptors in the Brain: Potential Interactions with Estrogen Signaling. *Int J Mol Sci*. 2018;19(4):1091.

JULY
2022

THE GUT-BRAIN AXIS

The gut is the largest digestive, immune, and endocrine organ in the human body, and possesses its own nervous system – the enteric nervous system, or ENS. While independent, the ENS engages in ongoing dialogue with the brain. The multiple routes of communication linking brain and gut are together known as the gut-brain axis (GBA), a bidirectional “information superhighway” that channels a volume of data so vast as to have earned it the moniker “the second brain.”

The existence of the GBA is not only fascinating but also full-to-bursting of implications that modern science may capitalize upon to further explore and understand human health. Among the more significant frontiers in modern GBA research is that which focuses on etiologic contributions of GBA dysfunction to psychiatric and neurologic illness.

Studies from a variety of disciplines have confirmed that abnormalities in the gut microbiota – the trillions of symbiotic microbes inhabiting the digestive tract – can and do impact the brain. Gut dysbiosis is now implicated in conditions ranging from eating disorders and anxiety to schizophrenia and dementia, which not only expands our understanding of disease pathogenesis but also reveals gut microbiota modulation as a promising target for new, evidence-based treatments.

This module will delve deeply into one of the most exciting frontiers in medical science. It will present the latest research to illuminate novel understandings of the ways in which the gut influences mood, cognition, and behavior, as well as studies that corroborate the clinical utility of GBA modulation for the treatment of psychiatric ailments. Fellows will be introduced to evidence-based strategies for mitigating gut dysbiosis and optimizing GBA health as an adjunct to personalized Functional Medicine approaches.

RECOMMENDED READINGS

- ❖ Dickerson F, et al. Adjunctive probiotic microorganisms to prevent rehospitalization in patients with acute mania: a randomized controlled trial. *Bipolar Disord*. 2018;20(7):614-621.
- ❖ Liang S, Wu X, Jin F. Gut-Brain Psychology: Rethinking Psychology From the Microbiota-Gut-Brain Axis. *Front Integr Neurosci*. 2018;12:33.
- ❖ Patrono E, Svoboda J, Stuchlík A. Schizophrenia, the gut microbiota, and new opportunities from optogenetic manipulations of the gut-brain axis. *Behav Brain Funct*. 2021;17(1):7.
- ❖ Seitz J, et al. Gut Feelings: How Microbiota Might Impact the Development and Course of Anorexia Nervosa. *Nutrients*. 2020;12(11):3295.

**AUGUST
2023**

Functional & Integrative Medicine for Irritability, Anger, Aggression & NSSI

This module examines the etiology and pathophysiology of chronic irritability, anger, aggression, and non-suicidal self-injury (NSSI) – prognostic of long-term treatment outcomes and thus key targets of Functional interventions.

Abundant research has confirmed psychiatric disorders involving heightened rage, suicidality, and self-injury to be associated with specific metabolic and neurologic abnormalities. By exploring biologic pathways that give rise to behavior and cognition, and how disruptions in such pathways can trigger pathology, Functional Medicine presents us with a complete paradigm for understanding the processes from which health and illness arise. And, thanks to advances in neuroimaging and nutritional biochemistry, actioning such a paradigm to promote balanced physical and mental health is possible.

Educational content presented in this module will introduce an integrated biopsychiatric model of irritability, anger, and rage, elucidating mechanisms through which nutritional, metabolic, and biochemical factors can elicit behavioral pathology. Research supporting associations between metabolic disturbances; amino acid, lithium, and essential fatty acid deficiencies; low cholesterol; psychotropic medications; and irritability will be objectively reviewed. Finally, evidence-based recommendations comprising a Functional Medicine approach to the treatment of anger and aggression will be described, providing Fellows with information that can be incorporated into existing therapeutic protocols.

RECOMMENDED READINGS

- ❖ Mazza M, Marano G, Lai C, Janiri L, Sani G. Danger in danger: Interpersonal violence during COVID-19 quarantine. *Psychiatry Res.* 2020;289:113046.
- ❖ Elbert T, et al. Lust for violence: Appetitive aggression as a fundamental part of human nature. *Neuroforum.* 2017; 23(2): A77–A84.
- ❖ Marchant A, et al. A systematic review of the relationship between internet use, self-harm and suicidal behaviour in young people: The good, the bad and the unknown [published correction appears in PLoS One. 2018 Mar 1;13(3):e0193937]. *PLoS One.* 2017;12(8):e0181722.
- ❖ Vilibić M, et al. Association between total serum cholesterol and depression, aggression, and suicidal ideations in war veterans with posttraumatic stress disorder: a cross-sectional study. *Croat Med J.* 2014;55(5):520-529.

SEPTEMBER
2022

INFECTIONS IN PSYCHIATRY

Functional Medicine holds that the sum total of human health is the product of an ongoing and dynamic negotiation between biology, psychology, and environment. Factors from each of these categories have the potential to impact mind and/or body, as well as the myriad processes and mechanisms underlying mental and physical homeostasis.

Environmental factors have long been recognized as robust determinants of mental health. Traditionally, analyses of such factors have largely focused on sociocultural and psychosocial influences. More recently, however, environmental factors that influence discrete neurobiologic processes have gained the attentions of the scientific community.

Studies investigating immune- and inflammation-related dysfunction have brought infection-mediated psychopathology into a novel limelight. Epidemiologic analyses have yielded stunning insights as to the prevalence of infectious cascades in mental illness, as well as robust evidence linking specific pathogens to diagnoses. Terms such as *B. burgdorferi*, *T. gondii*, *Streptococcus*, *C. difficile*, *C. albicans*, and more now appear throughout the literature; as this list grows, so does the impetus for clinicians to develop familiarity with infection-mediated psychiatric dysregulation.

This module will explore involvements of infection-related autoimmune, inflammatory, and neurologic cascades in mental illness. It will introduce empirical evidence linking specific pathogens with discrete diagnoses, focusing heavily on the neurologic sequelae of *Clostridia* and *Candida* overgrowth, presentations of PANS/PANDAS, and Lyme neuroborreliosis. Module content will focus heavily on methodology and clinical application, endowing Fellows with a working understanding of the laboratory evaluations, and treatment protocols indicated for patients with infection-mediated neuropsychiatric dysfunction.

RECOMMENDED READINGS

- ❖ Swedo SE, et al. Overview of Treatment of Pediatric Acute-Onset Neuropsychiatric Syndrome. *J Child Adolesc Psychopharmacol*. 2017;27(7):562-565.
- ❖ Hommer RE, Swedo SE. Anorexia and Autoimmunity: Challenging the Etiologic Constructs of Disordered Eating. *Pediatrics*. 2017;140(6):e20173060.
- ❖ Sutterland AL, et al. Beyond the association. *Toxoplasma gondii* in schizophrenia, bipolar disorder, and addiction: systematic review and meta-analysis. *Acta Psychiatr Scand*. 2015;132(3):161-179.
- ❖ Maxwell SP, et al. Neurological Pain, Psychological Symptoms, and Diagnostic Struggles among Patients with Tick-Borne Diseases. *Healthcare (Basel)*. 2022;10(7):1178

OCTOBER
2023

FUNCTIONAL & INTEGRATIVE MEDICINE FOR COGNITIVE DECLINE & ALZHEIMER'S

The global burden of Alzheimer's disease and other neurodegenerative disorders is massive. Attempts to find viable pharmaceutical cures have, thus far, failed, and the tolls borne by victims and family members remain incalculable.

Research has confirmed Alzheimer's to have a substantial prodrome, which is cause for hope. A prodrome represents an opportunity to steer neurologic aging towards health, and to modify certain etiologic factors while they remain modifiable. Such factors are tools that can be wielded to potentially significant effect in a Functional Medicine model centered upon prevention.

This module presents a novel Functional Medicine paradigm for the prevention of Alzheimer's and cognitive decline. It examines the pathophysiology of neurodegenerative illness from a systems biology framework, focusing on biochemical abnormalities contributing to neuronal dysfunction that are modifiable at prodromal stages and are, accordingly, viable treatment targets. Research supporting the use of evidence-based nutritional interventions as part of a preventative approach will be reviewed, and the mechanisms through which these interventions confer neuroprotection elucidated.

RECOMMENDED READINGS

- ❖ Marino A, et al. Natural Antioxidant Compounds as Potential Pharmaceutical Tools against Neurodegenerative Diseases. *ACS Omega*. 2022;7(30):25974-25990. doi:10.1021/acsomega.2c03291
- ❖ Jayedi A et al. Vitamin D status and risk of dementia and Alzheimer's disease: a meta-analysis of dose- response†. *Nutr Neurosci*. 2019 Nov;22(11):750- 759.
- ❖ Smith AD, et al. Homocysteine and dementia: an international consensus statement. *J Alzheimers Dis*. 2018;62(2):561-570.
- ❖ Greenblatt J. Alzheimer's redefined: nutritional lithium as the foundation for prevention. Excerpted from: Greenblatt J. *Integrative medicine for Alzheimer's*. Victoria, BC: FriesenPress; 2018.
- ❖ Hara Y et al. Evaluation of the neuroprotective potential of N-Acetylcysteine for prevention and treatment of cognitive aging and dementia. *J Prev Alzheimers Dis*. 2017;4(3):201-206.

NOVEMBER
2023

FUNCTIONAL & INTEGRATIVE MEDICINE FOR EATING DISORDERS

With a combined mortality rate exceeding that of any other mental illness, eating disorders (EDs) represent a serious challenge to today's clinicians. Whether pharmaceutical or psychologic, interventions comprising mainstream psychiatry's therapeutic arsenal for the treatment of anorexia nervosa, bulimia nervosa, and binge-eating disorder are, together, inadequate, as evidenced by consistently high rates of relapse across diagnoses. *We can do better.*

Instead of focusing exclusively on psychologic factors, we can examine the body as well as the mind – for biologic testing reveals EDs to be characterized by a host of physiologic abnormalities that affect brain function and contribute to the emergence of a disease state. While EDs initially present as preoccupation with food and weight, they ultimately become brain-based disorders marked by profound malnutrition.

This module reviews current ED models and presents an evidence-based Functional Medicine approach to treatment. New research illustrating the benefits of nutritional supplementation – with a special emphasis on zinc and essential fatty acids – to enhance patient outcomes and support relapse prevention will be explored, proving clinicians with a well-rounded therapeutic arsenal with which to face the challenges of eating disorder treatment with confidence.

RECOMMENDED READINGS

- ❖ Greenblatt J. Answers to anorexia: nourishing the brain and nurturing the mind. Excerpted from: Greenblatt J, et al. *Answers to anorexia (2nd ed.)*. Victoria, BC: FriesenPress; 2021.
- ❖ Shih PB. Integrating multi-omics biomarkers and postprandial metabolism to develop personalized treatment for anorexia nervosa. *Prostaglandins Other Lipid Mediat*. 2017;132:69.
- ❖ Parra-Fernández ML, et al. Pathological Preoccupation with Healthy Eating (Orthorexia Nervosa) in a Spanish Sample with Vegetarian, Vegan, and Non-Vegetarian Dietary Patterns. *Nutrients*. 2020;12(12):3907.
- ❖ Reed KK, Abbaspour A, Bulik CM, Carroll IM. The intestinal microbiota and anorexia nervosa: cause or consequence of nutrient deprivation. *Curr Opin Endocr Metab Res*. 2021;19:46-51.
- ❖ Valbrun LP. The Opioid System and Food Intake: Use of Opiate Antagonists in Treatment of Binge Eating Disorder and Abnormal Eating Behavior. *J Clin Med Res*. 2020;12(2):41-63.
- ❖ Greenblatt J. Psychiatry redefined – integrative medicine for binge eating. Excerpted from: Greenblatt J. *Integrative Medicine for Binge Eating*. Victoria, BC: FriesenPress; 2019.

DECEMBER
2023

FUNCTIONAL & INTEGRATIVE MEDICINE FOR SCHIZOPHRENIA & PSYCHOSIS

Schizophrenia is a multifactorial psychiatric disorder producing a spectrum of symptoms that range from odd-but-harmless behavioral abnormalities to full clinical psychosis. Such variable symptomatic presentations, in tandem with research supporting a biologic model of schizophrenia pathogenesis, invite Functional Medicine approaches to treatment that emphasize biochemical individuality and the mitigation of etiologic risk factors.

This module incorporates the classical theories of orthomolecular medicine into modern nutritional psychiatry, presenting decades of research evidence supporting the efficacy of Functional approaches to the treatment of schizophrenia. Micronutrient deficiencies, toxic neurochemical aggregations, systemic inflammation, and other etiologic factors will be elucidated in regard to the mechanisms through which they precipitate neurologic dysfunction, and addressed through comprehensive Functional protocols that can be applied in clinical practice.

RECOMMENDED READINGS

- ❖ Harrow M, et al. Does treatment of schizophrenia with antipsychotic medications eliminate or reduce psychosis? A 20-year multi-follow-up study. *Psychol Med*. 2014;44(14):3007-3016.
- ❖ Amminger GP, et al. Long-chain omega-3 fatty acids for indicated prevention of psychotic disorders: a randomized, placebo-controlled trial. *Arch Gen Psychiatry*. 2010;67(2):146-154.
- ❖ Greenblatt J. A functional perspective on gluten, psychosis, and schizophrenia. Psychiatryredefined.org. <https://www.psychiatryredefined.org/a-functional-perspective-on-gluten-psychosis-and-schizophrenia/>. Published October 14, 2019.
- ❖ Włodarczyk A, et al. Ketogenic diet for schizophrenia: Nutritional approach to antipsychotic treatment. *Med Hypotheses*. 2018;118:74-77.
- ❖ Tsamakakis K, et al. Gut Microbiome: A Brief Review on Its Role in Schizophrenia and First Episode of Psychosis. *Microorganisms*. 2022;10(6):1121.