Lifestyle Interventions and the Role of Gut Microbiome in Mental Health

ALICIA CRAIG-RODRIGUEZ, DNP, MBA, APRN, FNP-BC
FLORIDA STATE UNIVERSITY COLLEGE OF NURSING
The views expressed in this presentation are those of the author and do not necessarily reflect the position of the University or the College of Nursing.

No financial relationships with Lifestyle Medicine or Functional Medicine organizations.
At the end of this presentation, the learner will be able to:

- Explain current Lifestyle Medicine approaches to address the root cause of chronic disease.
- Explore the link between our gut microbiome and the central nervous system (CNS) and stress-related psychiatric disorders.
- Describe the rationale for implementing Lifestyle Medicine approaches to improve the health and well-being of our active duty military service members and veterans.
There is much in common between these medical disciplines.

Many clinicians practice in more than one domain.

All use lifestyle and a whole-person approach to care.

Complementary, not competitive.

Patients become more engaged, active participants in their own self-care, disease prevention and management, and overall well-being.

<table>
<thead>
<tr>
<th>Medical Discipline</th>
<th>Key Care Approach</th>
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<tbody>
<tr>
<td>Lifestyle Medicine</td>
<td>6 to 9 key lifestyle modalities to treat/reverse/prevent disease; Promotes a whole-food, plant-predominant diet</td>
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<tr>
<td>Preventive Medicine</td>
<td>Early detection/Screening; Environmental safety/public health</td>
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<tr>
<td>Functional Medicine</td>
<td>Root Cause Approach; Emerging diagnostics; Gut health; Nutritional Deficiencies/Replacement</td>
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<td>Naturopathic Medicine</td>
<td>Manipulation; Herbal remedies</td>
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<tr>
<td>Integrative Medicine</td>
<td>Combined use of complementary &amp; conventional medicine approaches to care &amp; treatment</td>
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Lifestyle Medicine: Simple, Powerful Evidence-Based Therapy

**Nutrition**
Choose predominantly whole, plant-based foods that are fiber-filled, nutrient dense, health-promoting and disease-fighting.

**Sleep**
Lack of, or poor quality sleep can lead to a strained immune system. Identify and alter dietary or environmental habits that may hinder healthy sleep.

**Exercise**
Regular and consistent physical activity is an essential piece of an optimal health equation.

**Substance Abuse**
The well-documented dangers of any addictive substance use can increase risk for many cancers and heart disease.

**Stress Management**
Identify both positive and negative stress responses with coping mechanisms and reduction techniques for improved wellbeing.

**Healthy Relationships**
Social connectedness is essential to emotional resiliency and overall health.

American College of Lifestyle Medicine [https://lifestylemedicine.org/](https://lifestylemedicine.org/)
Functional Medicine: Getting to the Root Cause

- A “Whole Systems” approach
- Assesses the underlying root causes of complex, chronic diseases
- Considers the unique genetic makeup of each individual, along with internal (mind, body and spirit) and external (physical and social environment) factors
- Looks “upstream” at the interactions in the patient’s history, physiology, and lifestyle that can lead to illness.
- Applies strategies such as nutrition, diet, and exercise to treat and prevent these illnesses in their patients.
- Intervention focuses on 1) Removing what causes imbalance, 2) Providing what promotes balance

Image Credit: Shutterstock.com

Adapted from Lipski, E. (2020)
Conclusion: The reversal of established medical practice is common and occurs across all classes of medical practice.

Prasad, et al., 2013
PERCENT OF PATIENTS TAKING MEDICATION FOR THEIR CONDITION AND AN ANTIDEPRESSANT

By condition, 2019

- Diabetes (oral): 23.3%
- High blood cholesterol: 23.7%
- High blood pressure: 24.3%
- Opioids: 24.7%
- Cancer: 26.3%
- Inflammatory conditions: 26.5%
- Insomnia: 52.2%
- Parkinson’s disease: 51.6%
- Anxiety: 49.6%
- Multiple sclerosis: 35.6%
- COPD: 32.3%
PERCENT CHANGE IN PRESCRIPTIONS FILLED PER WEEK FOR MENTAL HEALTH MEDICATIONS

By select weeks from January 19, 2020 to March 15, 2020

[Graph showing percent change in prescriptions filled per week for mental health medications from January 19, 2020 to March 15, 2020. The graph indicates a significant increase in prescriptions for depression, anxiety, and insomnia, with the total prescriptions showing the most substantial rise.]

OBJECTIVES

At the end of this presentation, the learner will be able to:

- Explain current Lifestyle Medicine approaches to address the root cause of chronic disease
- **Explore the link between our gut microbiome and the central nervous system (CNS) and stress-related psychiatric disorders.**
- Describe the rationale for implementing Lifestyle Medicine approaches to improve the health and well-being of our active duty military service members and veterans.
“All Disease Begins in the Gut”

- HIPPOCRATES
Mental Health: By the Numbers

- 1 in 5 U.S. adults experience mental illness each year
- 1 in 25 U.S. adults experience serious mental illness each year
- 1 in 6 U.S. youth aged 6-17 experience a mental health disorder each year
- Rates of cardiometabolic disease are twice as high in adults with serious mental illness
- Depression and anxiety disorders cost the global economy $1 trillion each year in lost productivity

National Alliance on Mental Illness: https://www.nami.org/About-Mental-Illness/Mental-Health-Conditions/Anxiety-Disorders
Meet Your Gut: The Body’s Headquarters

- Houses microorganisms (bacteria, viruses, fungi) that outnumber our cells 10 to 1
- Has its own nervous system- 90% of the nerve fibers afferent
- Produces >90% of the body's serotonin, ~50% of the body's dopamine
- Surveys/Modulates (GALT), and represents 70%-80% of the body’s immune system
- Produces nutrients, enzymes, and releases chemical messengers that speak to the brain

Lipski (2020)
“If you don’t like bacteria, you’re on the wrong planet.”

--STEWART BRAND (EDITOR OF THE WHOLE EARTH CATALOG, FOUNDER OF THE WELL.)

Human Microbiome Project https://www.hmpdacc.org/hmp/ ; Lipski (2020)
Common Symptoms/Diseases Associated with Dysbiosis

- Alzheimer’s Disease
- Anxiety
- Arthritis
- Asthma
- Depression
- Eczema
- Diabetes/Metabolic Syndrome

- Fibromyalgia
- Interstitial Cystitis
- Irritable Bowel Syndrome
- Multiple Sclerosis
- Parkinson’s Disease
- Psoriasis
- Restless Leg Syndrome

Lipski (2020)
The Gut-Brain Axis

- Encompasses the central, autonomic and enteric nervous systems, as well as the neuro-endocrine, enteroendocrine and neuroimmune systems
- Bidirectional communication between the gut and central nervous system (CNS)
- Examples of this seen by high rates of comorbidity between gastrointestinal and psychiatric illnesses
  - >50% of IBS Patients have mood disorders

communication pathways linking the gut microbiome with brain function.

Rogers, et al., 2016
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4879184/
**Enteric Nervous System (ENS)**

- Our “second brain” or “first brain?”
- 100 million neurons
- Connected directly to the brain through the Vagus Nerve (Latin for “Wanderer”)
- **Bidirectional communication** between the gut and brain
  - 90% nerve fibers are **afferent** (gut → brain)
  - Gut-generated inflammation can lead to mood disorders
- **Neurotransmitter synthesis**
  - >95% serotonin (sleep, pain regulation, mood)
  - ~50% of dopamine (focus, muscle control, memory, learning new habits)

[Image Credit: G Oppenheimer Center for Neurobiology of Stress and Resilience](http://uclacns.org/about-cns/research-themes/the-brain-and-gut/)
The Tantalizing Links between Gut Microbes and the Brain

Neuroscientists are probing the idea that intestinal microbiota might influence brain development and behavior

By Peter Andrey Smith, Nature magazine on October 24, 2015

Breaking down the barriers: the gut microbiome, intestinal permeability and stress-related psychiatric disorders

John R. Kelly 1,2, Paul J. Kennedy 1, John F. Cryan 1,2, Timothy G. Dinan 1,2, Gerard Clarke 1,2* and Niall P. Hyland 1,4

1 Laboratory of Neurogastroenterology, APC Microbiome Institute, University College Cork, Cork, Ireland, 2 Department of Psychiatry and Neurobehavioural Science, University College Cork, Cork, Ireland, 4 Department of Anatomy and Neuroscience, University College Cork, Cork, Ireland, 5 Department of Pharmacology and Therapeutics, University College Cork, Cork, Ireland

The emerging links between our gut microbiome and the central nervous system (CNS) are regarded as a paradigm shift in neuroscience with possible implications for not only understanding the pathophysiology of stress-related psychiatric disorders, but also their treatment. Thus the gut microbiome and its influence on host barrier function is positioned to be a critical node within the brain-gut axis. Mounting preclinical evidence broadly suggests that the gut microbiota can modulate brain development, function and behavior by immune, endocrine and neural pathways of the brain-gut-microbiota axis. Detailed mechanistic insights explaining these specific interactions are currently underdeveloped.
Potential neuropsychiatric consequences of a dysregulated intestinal barrier. Activation of brain-gut-microbiota Axis signaling pathways via a compromised intestinal barrier with potential effects on mood, anxiety, cognition and social interaction.

The Diet-Microbiome Tango

- Profoundly affects brain function and behavior
- Critically relies on the host diet to synthesize important nutrients, which provide raw materials to synthesize neurochemicals such as serotonin, γ-aminobutyric acid (GABA), dopamine or norepinephrine.
- The nutrients synthetized by the microbiome (vitamins, amino acids and short chain fatty acids) can themselves affect brain function and behavior.

Serotonin Synthesis

- **Tryptophan**
  - Enzyme cofactors: (Iron, B3, Folate)

- **5 HTP**
  - Enzyme cofactors: (Iron, B6)

- **Serotonin**
  - Requires B2, Copper

- **Melatonin**
  - Enzyme cofactors: (SAMe, Magnesium)
Dopaminergic Pathway

Phenylalanine
- EAA (food) - requires adequate protein intake, digestion & absorption

Tyrosine
- Enzyme cofactors: (Iron, B3, Folate)

L-Dopa
- Enzyme cofactors: (B6)

Dopamine
- Enzyme cofactors: Vitamin C, Copper

Norepinephrine
- Enzyme cofactors: (SAMe, Magnesium)

Epinephrine
- Enzyme cofactors: (B6, B12, Magnesium)
Eating for Mental Health
“Let food be thy medicine and medicine be thy food.”
-Hippocrates
He who does not know food, how can he know the diseases of man?

-Hippocrates
<table>
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<tr>
<th><strong>Foods that Nourish the Gut:</strong></th>
<th><strong>Vitamins to Support Neurotransmitter Synthesis:</strong></th>
<th><strong>Minerals/ Addit’l Support:</strong></th>
</tr>
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<tbody>
<tr>
<td>Dietary Fiber (promotes Bifidobacterium and Lactobacillus species)</td>
<td><strong>Vitamin D3</strong> (“neurosteroid” that crosses BBB/decreases inflammation in brain)</td>
<td>Magnesium (eases stress responses)</td>
</tr>
<tr>
<td>Omega 3s (suppress the effects of IL-1, and inflammatory marker that causes an increase in dopamine)</td>
<td>Vitamin B1 (protects hippocampus)</td>
<td>Potassium</td>
</tr>
<tr>
<td>Fermented Foods (yogurt, kimchi, kombucha, apple cider vinegar) protective of the nervous system</td>
<td>Vitamin B6</td>
<td>Selenium</td>
</tr>
<tr>
<td>Tryptophan (chickpeas, or supplement)</td>
<td>Vitamin A</td>
<td>Omega 3s: (if not getting in food)</td>
</tr>
<tr>
<td></td>
<td>Vitamin C</td>
<td>Lavender</td>
</tr>
<tr>
<td></td>
<td>Vitamin E</td>
<td>L-Lysine, L-Arginine</td>
</tr>
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**Passionflower** (increases GABA without sedation)

*Turmeric (protects hippocampus)*

*Contraindicated if using blood thinners*
Lifestyle Medicine:
MAKING THE CASE FOR ACTIVE DUTY MILITARY & VETERANS
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Although healthier upon entering military service compared to the general population, in the longer-term, veterans tend to be of equivalent or worse than civilians...attributed to poorer health behaviors during and after military service, especially areas of physical activity, nutrition, tobacco and alcohol use.”

Keywords: Military · Veteran · Servicemember · Health behavior · Health promotion · Healthcare · Behavioral health
Military Health-Care Behaviors

- Depression: five times higher than in civilians
- Posttraumatic Stress Disorder (PTSD). Fifteen times higher than in civilians.
- Poorer health behaviors than general population (physical activity and poor diet);
- More likely to smoke, abuse alcohol, and have obesity;
- 33% are more likely to have HTN;
- 51% of service members overweight, 14.7% obese
- 50% of males, 75% of female svc members report chronic pain

https://www.nami.org/Your-Journey/Veterans-Active-Duty
Between 2008 and 2017 active duty soldiers experienced more than 3.6 million musculoskeletal injuries.

658k total lost workdays due to overweight and obesity for active duty military personnel. This costs the Department of Defense $103 million per year.

The Department of Defense spends ~$1.5 billion annually in obesity-related health care costs for current and former service members and their families, as well as costs to replace unfit personnel.

• Every year, >200,000 US service members transition out of active military service
• National sample (n=9,566) reported chronic physical (53%) and mental (33%) health conditions
• Critical period for prevention and early targeted intervention

While physical fitness is strongly promoted, nutritional fitness has not been routinely emphasized;

Despite formal physical fitness training and regular fitness/body weight assessments, service members face chronic stressors (deployment, travel, active combat), leading to excess body weight, and metabolic dysfunction.

Surge of weight gain following military separation.
Military & Veteran Life Course - United States

Servicemembers: A member of the uniformed services
2.1 million/ Ages 17 - 62 years

Veterans: Former servicemembers
21 million/ Ages 17 - 120 years

Military Service:
Initial contract 4 - 8 years/ retirement after 20 years*

Key Transition Periods*
- Basic Training 8 - 13 weeks
- Advanced Training 6 - 102 weeks
- Military Service Assignment(s)*
  - Unit 1: 2-3 years Dep.
  - Unit 2: 2-3 years Dep.
  - Unit X: 2-3 years
- Separation or Retirement

Healthcare
- Active Duty: Covered under MHS/TRICARE
- Reserves/guard: Some limited coverage under MHS/TRICARE
- Eligible Veterans: Full or limited coverage in VHA

Hailbach, et al. (2016).
Burger King awarded military base contract

BY SUSAN POSTLEWAITE, UPI
Business Writer

MIAMI -- Burger King was awarded a lucrative contract to serve Whoppers and pita salad sandwiches to U.S. troops at 185 military base restaurants in the United States and abroad, officials said Wednesday.

The five-year contract was awarded to the nation's No. 2 hamburger chain May 15 by the Army and Air Force Exchange Services, AAFES, but was not disclosed until Wednesday.

'It's the largest single deal we've ever done,' said Steve Finn, vice president of public relations for Miami-based Burger King.

'I don't think you can overestimate the value of this thing. It's pretty impressive to be able to say the United States military is going to be fed exclusively by Burger King,' Finn said.
75th Field Artillery Brigade CWO powers up with plants

By James Brabec Aug 2018

Fort Sill's dining facility is the first to offer troops a 100 percent plant-based entrée at every meal.

FEB 2019

“What if all recruits were trained and motivated to take care of their own bodies as well as they are to take care of their rifle, their sidearm, or perform their military occupational specialty?”

Hailbach, et al. (2016)
Strategy 2.1.4: Emphasizing Veterans’ And Their Families’ Whole Health & Wellness

- VA will significantly improve Veteran health outcomes by shifting from a system primarily focused on disease management to one that is based on partnering with Veterans throughout their lives and focused on Whole Health. VA will provide personalized, proactive, patient-driven health care to empower, equip, and encourage Veterans to take charge of their health, well-being, and to adopt healthy living practices that deter or defer preventable health conditions.
**VHA Mission**
Honor America’s Veterans by providing exceptional health care that improves their **health** and **well-being**

**WHOLE HEALTH**
It is an approach to health care that **EMPOWERS** & **EQUIPS** people to take charge of their health and well-being and live life to the fullest. This is, in part, accomplished through developing a **PARTNERSHIP** with the Veteran

**Sick Care**
“What’s the matter with you?”

**Health Care**
“What matters to you?”
VA Whole Health

“We are about cultural change—this is the Whole Health Approach...we will lead American Medicine as we transform.”

Richard A. Stone, MD
Executive in Charge
Veteran’s Affairs
For Deeper Exploration
For Deeper Exploration
For Deeper Exploration

http://www.va.gov/patientcenteredcare/
Thank You!

Alicia Craig-Rodriguez, DNP, MBA, APRN, FNP-BC

acraigrodriguez@fsu.edu