

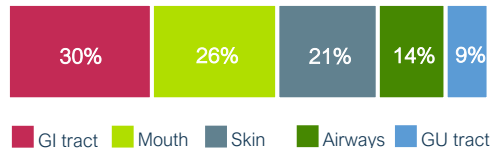
# Microbiome and Non-traditional Therapies for *C. difficile* Infection

## A Primer for Healthcare Professionals

### The Microbiome is Essential for Human Health

The human microbiome is comprised of more than 100 trillion microbial cells and over 1,000 known bacterial species, including the predominant phyla Bacteroidetes, Firmicutes, Proteobacteria, and Actinobacteria.<sup>1,2</sup> Given the critical functions of commensal microbiota, healthcare professionals can care for a patient's microbiome by trying to preserve the diversity and abundance of microorganisms.

#### Microbial abundance varies by body site<sup>3</sup>

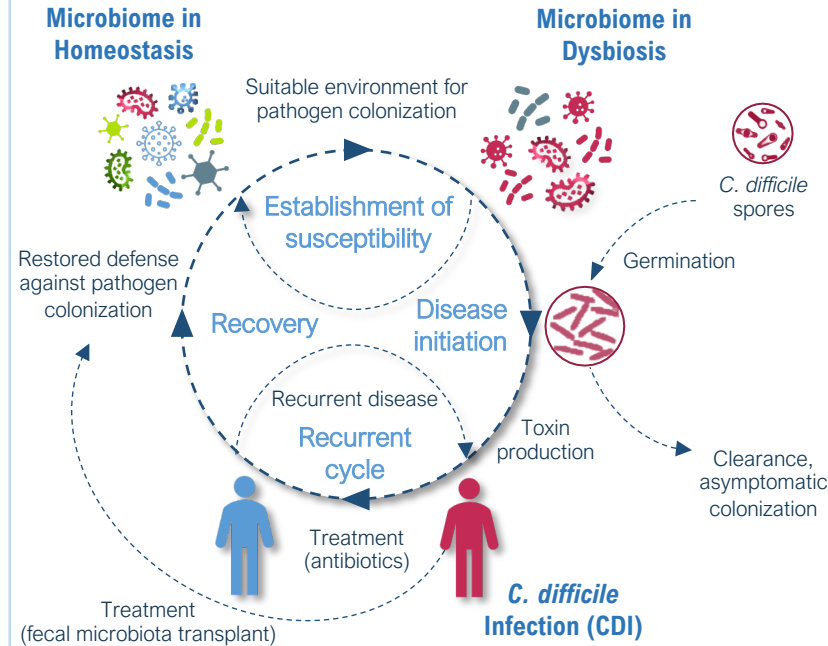


#### Gut microbiota promote and preserve health<sup>4</sup>



Metabolizes drugs  
Modulates immune response  
Protects against injury  
Regulates hormones  
Resists pathogens

### *Clostridioides difficile* and the Human Microbiome<sup>6</sup>



### Microbiome-Targeted Interventions<sup>11</sup>

Prescribers can positively impact the microbiome through evidence-based interventions including:

#### Antibiotic Stewardship

- Avoid unnecessary antimicrobials
- Prescribe narrow-spectrum antibiotics for the shortest possible duration when indicated
- Practice diagnostic stewardship

#### Diet and Prebiotics

- Plant-based, Mediterranean diets increase bacterial diversity
- Prebiotics (substrates used by microbiota) may promote beneficial microbes

#### Fecal Microbiota Transplant (FMT)

- Transfer of healthy donor feces into GI tract
- Effectively restores microbiome diversity
- Recommended after three episodes of CDI
- Currently being studied for cancer and IBD

#### Probiotics

- Live organisms intended to promote health
- Safe for most patients
- Not recommended to treat CDI
- Discrepancies in dose and organisms studied

### Dysbiosis May Result in Reduced Microbiome Functional Capacity

Dysbiosis is defined as a significant change in the microbiome structure or function and is associated with more than two dozen health conditions, including **infection, inflammatory bowel disease, obesity, diabetes, cancer, cardiovascular disease, & immunosuppression**.<sup>4,5</sup>



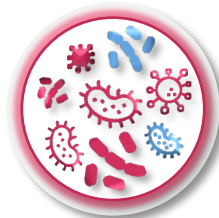
#### Homeostasis

Microbiome homeostasis is preserved by maintaining microbial diversity through a healthy diet and lifestyle



#### Reduced Diversity

Characteristics associated with reduced diversity include antibiotics, gastric acid suppressants, older age, and chronic disease



#### Dysbiosis

Reduced microbial diversity, loss of beneficial microbes, and expansion of pathogenic microbes occurs with dysbiosis

### *Clostridioides difficile*: An Urgent Public Health Threat

*C. difficile* infection (CDI) is the most well-studied microbiome-associated condition.

Dysbiosis shifts the microbiome to favor *C. difficile* growth. Vegetative forms produce toxins, leading to inflammation and severe diarrhea.

Antibiotics are commonly indicated to treat CDI which further disrupts the gut microbiome and can lead to recurrent infection.

CDI remains a significant risk for up to three months following antibiotics.

**500 thousand**  
Americans infected annually<sup>7</sup>

**1 in 4 patients**  
experience CDI recurrence<sup>8</sup>

**9% mortality**  
in hospitalized patients<sup>9</sup>

**\$5 billion**  
annual healthcare costs<sup>10</sup>

### FMT Preparation and Process<sup>12</sup>

#### 1. HEALTHY DONOR STOOL SAMPLE

Donor samples are screened for general health and pathogens

#### 2. SAMPLE PROCESSING

Preparation and filtration leave a healthy microbiome

#### 3. SAMPLE FORMULATION

Pill and liquid formulations available for transplantation

#### 4. TRANSPLANT

Administered via nasogastric, oral, enema, or colonoscopy



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