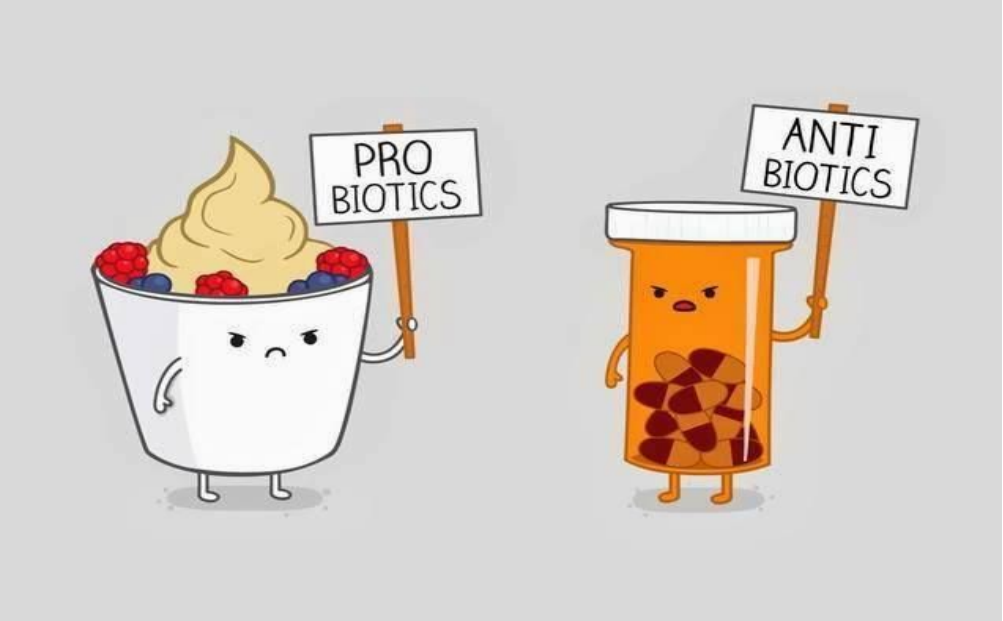
STANDARD DEVIATIONS: Flora, Friend or Foe?



Friends,

This is just a gut feeling, but we don't know enough about our microbiome. The latest issue of Nature Microbiology reports the finding that some **patients with depression are deficient in certain species of normal microbiota**. The relationship between gut microbial metabolism and mental health is an intriguing subject of microbiome research. Those microbes are producing hormones (cortisol), neurotransmitters (dopamine, serotonin, GABA, tryptophan), short-chain fatty acids, and immune system modulating compounds. Our central nervous system is intimately connected to the human gut, and our grasp of that relationship is not well understood.

What we do know, and are beginning to really understand, is that antimicrobial resistance is affecting the composition of our normal flora. When we use antibiotics in broad spectrum treatments, we are indiscriminate in the organism we target. This allows resistant bugs to monopolize our gut, and when those are toxin-producing (like *C. diff*) we create new problems.

This is why our elderly, immune-compromised, and antibiotic-treated patients are susceptible to these infections; AMR drives changes in normal flora that allow deleterious microbes to proliferate and poison us.

Fecal microbiota transplantation (FMT) and the microbiota-gut-brain axis are rapidly growing areas of study to treat many disorders besides *C. diff*. Crohn's disease, ulcerative colitis are being treated with FMT, but Parkinson's, autism, multiple sclerosis, chronic fatigue, metabolic, and autoimmune disorders are foci of research with FMT treatment.

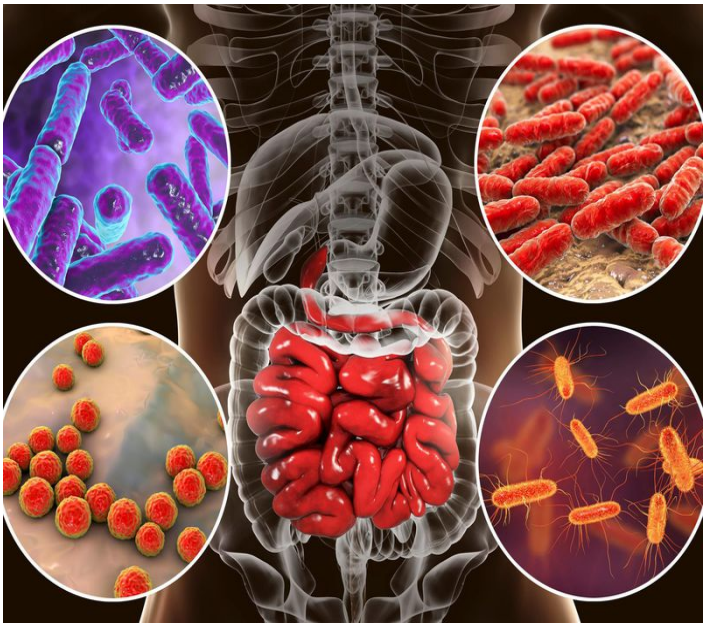
How prevalent are these microorganisms? The human gut hosts 10^{14} (100 trillion) living microorganisms. That's an order of magnitude greater than the total number of cells in our body. Genetically, these guys have 150 times the number of genes we do. The metabolic and genetic variations and contributions are barely known. For thousands and thousands of years, human evolution has taken place with microorganisms interacting with our bodies.

In the last few decades, our development, use and abuse of antimicrobials has altered the landscape of the microbiota-gut-brain axis. We know that AMR is a growing and threatening condition of concern. Resistance in *Enterobacteriaceae* (*Escherichia coli, Klebsiella pneumoniae*, et al) is going to drive much of our laboratory workload in the coming years. Approximately 20% of *Klebsiella pneumoniae* infections and 31% of *Enterobacter spp* infections in intensive care units in the United States now involve strains not susceptible to third-generation cephalosporins. **By 2050, serious estimates predict 10 million AMR related deaths (and $100 trillion in cost).**

A disturbing unknown is the ramification of antimicrobial usage and resistance to the gut-brain symbiosis and our dependence on the normal flora we've evolved with until now. Will we see substantial change to the neurological, metabolic, and immunological norms because we change our microbiota? And will those changes result in new, harmful paradigms in our health?

Have a great week and be safe,

Bryan



References:

https://doi.org/10.1038/s41564-018-0337-x

www.ncbi.nlm.nih.gov/pmc/articles/PMC4977816/

www.ncbi.nlm.nih.gov/pmc/articles/PMC5889426/

Int J Infect Dis. 2018 Mar; 68: 50–53

Am J Med. 2006 Jun;119(6 Suppl 1):S20-8; discussion S62-70

http://reports.weforum.org/global-risks-2018/anti-microbial-resistance/