CURRENT PRACTICES IN THE USE OF PROBIOTICS DURING ANTIBIOTIC TREATMENT

By

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ABSTRACT

Nicholas Alan Kerna: Current Practices in the Use of Probiotics
During Antibiotic Treatment
("Under the direction of George Einstein")

Physicians and other healthcare providers have long posited, even in the absence of supporting scientific research, that the work of probiotics is to substitute the gut microbes destroyed by the antibiotics during antibacterial therapy. Over time, mostly due to observation and anecdotal evidence, it became widely accepted that probiotics have a beneficial effect on the human body in reducing, or even eliminating, certain side-effects and unwanted consequences of antibiotic treatment, as well as supporting the natural intestinal flora that may be disrupted during the use of antibiotics. Much current research supports these prior hypotheses and practices, that probiotic use is beneficial during antibiotic therapy, particularly in eliminating or limiting antibiotic-associated diarrhea (AAD), disruptions of the epithelium of the lower intestine tract due to clostirium diffice infections (CDI), and even yeast (candida) infestation secondary to antibiotic therapy. Although there are no scientifically documented or medically endorsed guidelines regarding the administration of probiotics during a course of antibiotics, especially in the timing of the doses of each group (the probiotic and the antibiotic), the general consensus among researchers and physicians is that it is better to stagger the doses of the probiotic and the antibiotic to enhance efficacy. It is suggested to take the probiotic 2-6 hours after the antibiotic

dose through the entire course of antibiotic treatment, and continue with the probiotic 7-10 days after ending the antibiotic regime. It is also helpful to take probiotics before beginning antibiotic therapy, if possible. In this review it is also noted that more research is needed on the interaction of probiotics and antibiotics during concurrent therapy due to concerns about antibiotic resistance which may be conferred by way of certain strains of probiotics; and approved medical guidelines for the concurrent use of probiotics and specific antibiotics need to be developed. Several interesting and relevant research topics relating to probiotic use during antibiotic therapy are offered herein. Finally, two new medical acronym are suggested to streamline communication: PEAT which stands for probiotic-enhanced antibiotic treatment / therapy); and hAMR which represents antimicrobial resistance developed through the horizontal gene transfer pathway.

To Penny

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PREFACE

During an ongoing course of antibiotic therapy, I was about to ingest a probiotic supplement to presumably nurture my intestinal flora. As I raised the whitish capsule toward my mouth, I paused and posited, “Could this probiotic possibly diminish the efficacy of the antibiotics I was taking?” I was not sure. So, I set out to find out. Along the way, other questions arose, and these questions begged investigation. The initiatory question led to collateral questions, each requiring an answer to better understand the primal question. Thus began a journey; another name for medical research. This research journey set out to discover “current practices in the use of probiotics during antibiotic treatment.” But to get there, I had to climb many hills and descend into many valleys; I had to take many detours. I had to travel back in time over 100 years to the Causcasus Mountains in Bulgaria, and forward into the future of medical research with MD simulation and the super microscope. There were other stops along the way, such as: digging into the pathways of antimicrobial resistance and horizontal gene transfer; discovering mathematical models, and developing a basic model of antimicrobial resistance as a cofactor in disease and mortality; learning of antibiotic resistance factors of certain strains of probiotics and the implications thereof in clinical epidemiology and clinical pharmacology; becoming more familiar with the wonders and workings of the seemingly limitless human microbiome; and much, much more. Hearing certain phrases repeated so often in

the literature, spawned the invention of two acronyms: PEAT which stands for probiotic-enhanced antibiotic therapy; and hAMR which stands for antimicrobial resistance via the horizontal gene transfer pathway. In the end, the six proposed research questions were answered in correlation to the current state of studies and available information on the topics, and as well as I was capable of doing under the given dissertation parameters; and recommendations for future research were offered. The following twelve chapters are a record of this journey.

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LIST OF ABBREVIATIONS

AAD	Antibiotic-associated diarrhea
AMR	Antimicrobial resistance
CDC	Center For Disease Control and Prevention
CDI	Clostridium Difficile Infection (C. diff.)
COG	Clusters of Orthologus groups
ECM	Albert Einstein College of Medicine
FDA	Food and Drug Administration
JAMA	Journal of the American Medical Association
JPH	Journal of Probiotics and Health
GABA	Gamma-aminbutyric acid
hAMR	Antimicrobial resistance via horizontal gene transfer
HGT	Horizontal gene transfer
IgA	Immunoglobulin A
MD	Molecular Dynamics
MDR	Multi-drug resistance
NCBI	National Center for Biotechnology Information
PAMTA	Preservation of Antibiotics for Medical Treatment Act
PEAT	Probiotic-Enhanced Antibiotic Treatment
RAND	Research and Development Corporation