American Spinal Injury Association
Annual Scientific Meeting
May 20-23, 2024 · San Juan, Puerto Rico

Translational Science and Research in Urinary Tract Infection and Lower Urinary Tract Symptoms

Course ID 217

Suzanne Groah MD, MSPH, MedStar National Rehabilitation Hospital
Rochelle E. Tractenberg, PhD, MPH, PhD, PStat®, FASA, FAAAS; Departments of Neurology; Biostatistics, Bioinformatics & Biomathematics; and Rehabilitation Medicine, Georgetown University; Alan Wolfe, PhD

Urinary tract infection (UTI) is the most common outpatient infection and for people with spinal cord injury and disease (SCI/D) and neurogenic lower urinary tract dysfunction (NLUTD), UTIs are the most common (2.5 per person/year) and costly secondary condition cause for emergency room visits, and infectious cause of hospitalization. The standard treatment approach to UTI (oral or intravenous antibiotics, typically targeting Gram-negative bacteria for 7-14 days) is flawed, as it is based on outdated and imprecise dogma that: (1) healthy urine is sterile (we now know that a urinary microbiome [urobiome] exists); (2) UTIs occur when a single uropathogen invades the "sterile" bladder (it ignores polymicrobial infections); and (3) relies on a standard urine culture (SUC) that preferentially grows E. coli over most other uropathogens and commensals. Innovations in basic and clinical science are clearly urgently needed. In this course, we will present a newly expanded model of translational science, contextualized in the example of the full spectrum of translational science relating to UTI in SCI/D, including regulatory issues and the typically-ignored translation from science to industry rather than solely focusing on translation to practice. The example will describe how the clinical problem of UTI diagnosis and treatment was identified in the clinical setting, and present examples of backward, forward and lateral translational research that are currently being conducted to overturn long held dogma and transform contemporary thinking. Specifically, we will demonstrate: •That high throughput 16S rRNA gene sequencing and our novel enhanced urine culture protocol (Expanded Quantitative Urine Culture) reveal bacterial DNA and live bacteria, respectively, in catheterized (bladder) urine deemed culture-negative by SUC; • Differences and associations between the bacterial species of the neurogenic vs. neurologically intact bladder, and of the female urobiome and post-instrumentation and post-operative UTI, urge urinary incontinence (UUI), and response to overactive bladder treatment. •That some Lactobacillus species are associated with a lack of symptoms and protection against symptoms or post-instumentation UTI. These results strongly support the proposition that certain bacterial species of the human urobiome have protective capabilities and that imbalance (dysbiosis) can result in disorders, such as UTI; •That live biotherapeutic products (LBPs) are microbiome-modulating therapies (such as probiotics) that may promote health by restoring homeostasis to a dysbiotic microbiome and correct dysbiosis associated with UTIs and other LUTS; •Several hypothesized mechanisms of LBPs, including competition with pathogens for nutrients and attachment sites, biofilm disruption, production of antimicrobial factors, immunomodulation, and regulation of gene expression. •An example of translation of these scientific advances to commercialization at the same time that scientific translation is ongoing. In sum, we will present a myriad of new opportunities for impactful translational science that address the challenge of UTI and LUTS among people with SCI and NLUTD, and these opportunities fall at all points along a translational science continuum.

Learning Objective 1 Describe forward, backward, and lateral scientific translation.
Learning Objective 2 Characterize the type of translational research ideas they have in mind using the translational science continuum presented.
Learning Objective 3 Determine two translational science types (forward, backward, lateral) that could be relevant for their work, research team, or area of interest.