CAIRIBU UROBIOME RESEARCH INTEREST GROUP (U-RIG)

CAIRIBU U-RIG RESEARCH HOURS

EXECUTIVE SUMMARY 12/13/2024 U-RIG RESEARCH HOUR

Invited: All those who have previously participated in any CAIRIBU U-RIG activities

Participated: Emily Coffey, Hrishikesh Dalvi, Nicole De Nisco, Jean-Phillipe Gourdine, Vanessa Hale, Lisa Karstens, Aaron Miller, Bob Moreland, Santosh Paudel, Mari Winkler, Mariana Coughlin, Kris Penniston

Discussion focused on the challenges and opportunities in urobiome research. We reviewed:

1. The "mind map" created originally when the CAIRIBU U-RIG formed (FIGURE 1), which focused on problems and needs
2. Knowledge gaps and areas for improvement identified in the October 2024 U-RIG conceptual activity (FIGURE 2).

Key points included the **need for better methods and consensus on approaches**, importance of **patient engagement**, and necessity for **diverse clinical trials**. The discussion highlighted the limitations of current funding sources, such as from NIH, and the potential for alternative funding from organizations like the Gates Foundation. Participants emphasized the need for **shareable data and resources**, and **the importance of understanding microbial metabolism and function**. They also discussed the potential for collaborative efforts to address these challenges and the possibility of forming a consortium to enhance research coordination and funding opportunities.

Figure 1

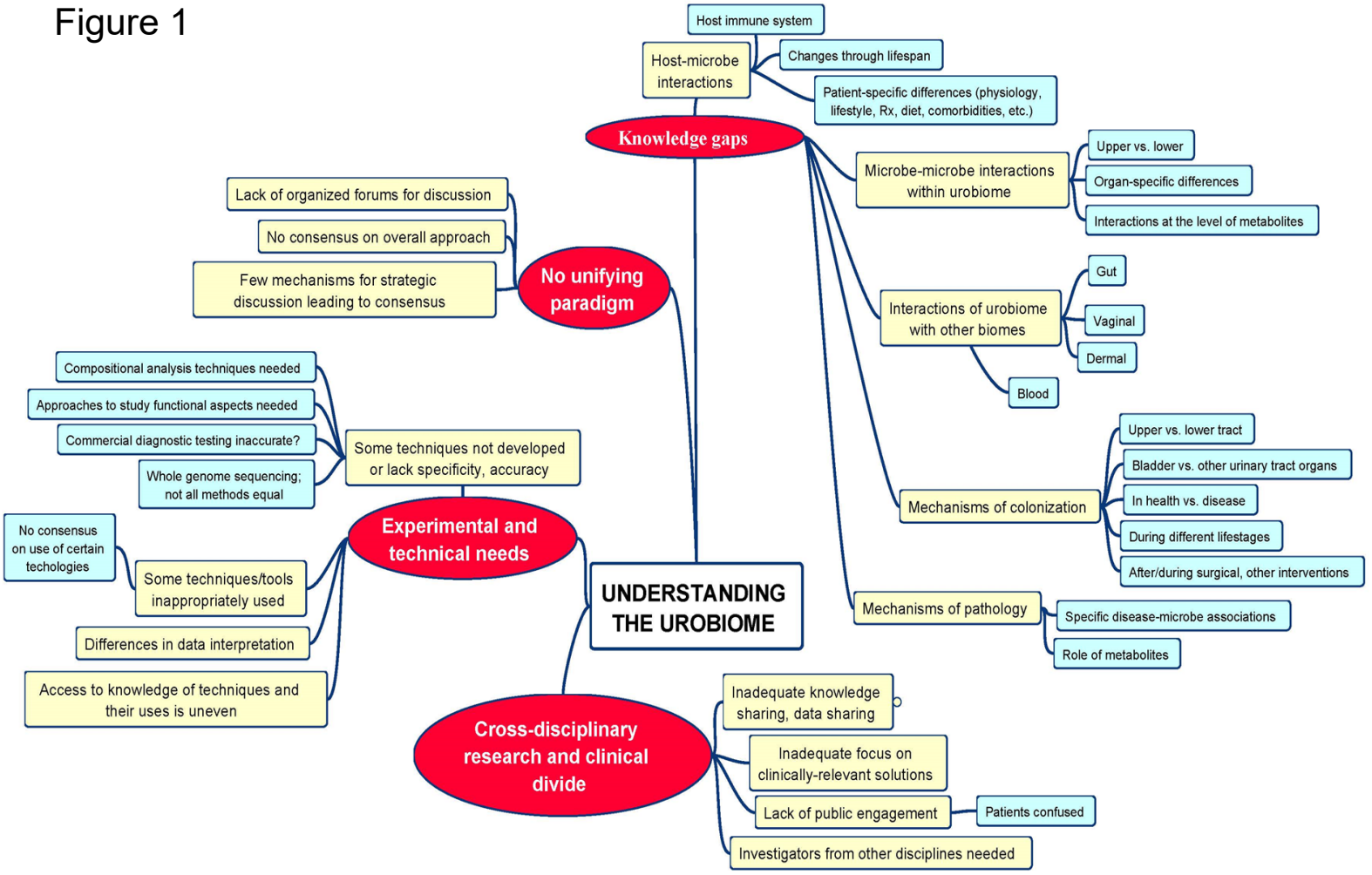

Figure 2


OBJECTIVE: Identify and address knowledge gaps
Funding and Advocacy
Trainees need funds to stay in the field
Funding sources overall are lacking
Patient engagement needed
Public advocacy needed
Approaches and Methods
Need consensus on methods
Validated animal models needed
Validated in vitro systems needed
In vivo systems to study host-microbe interactions needed
Methods to quantify absolute bacterial abundance
Process to deal with naiming conventions and reduce redundancy
Phenotypes and Profiles
Approaches to phenotype by urobiome profiles
Define urotypes by age, sex, disease/health status, geographic locale, diet, SES, etc
Profile changes through lifespan
Sharabe Data and Resources
Sharable data sets for urobiome controls
Robust reference database of urinary tract microbial genomes
Publicly-available data, including catalog of species with accompanying information
Microbial Metabolism and Function
Relationships with gut microbiome, other microbiomes
Relationships within LUT
Microbial metabolic needs
Translocation, migration mechanisms
Hormonal regulation
Metabolism of host and xenobiotic substrates in bladder
Host-microbe interactions
Microbial pathogen adaptation
Mechanisms for how non-canonical uropathogens cause disease
Clinical Studies and Interventions
Innovative intervention designs
Patient-engaged, patient-centered studies
Large-scale population-based studies
More diverse study participants
Oral probiotic and prebiotic studies
Clinician Education
Awareness of urobiome among clinicians
Evidence for/against antibiotics
Limitations of current culture and testing methods
Coordination and Collaboration
Learn from knowledge and advances in other microbiome research
Coordinate efforts across the field
Conscious and strategic collaborations
Collaborations with clinicians, social scientists, environmental scientists, etc.
Unified paradigm to guide collective research

Review of Previous Discussion and Knowledge Gaps

- Kris Penniston shared the concept map created from the Nov 2024 discussion (FIGURE 2), highlighting the difference between this one – which focuses on research problems and areas for improvement – and the one developed a couple of years ago (FIGURE 1) – which focused on identifying knowledge gaps and barriers.
- The new map (FIGURE 2) includes categories such as funding and advocacy, innovative approaches, phenotypes and urobiome profiles, clinical studies, shareable data, clinical education, and microbial metabolism.
- Overall, **participants emphasized the need for a more strategic, collaborative, and coordinated approach** to make an impact in urobiome research.

Patient Engagement and Clinical Trials

- Several said the topic of **patient engagement** and the **challenges of dealing with patient inquiries** should be prioritized. Sub-topics to think about include: engaging with patients via social media and blogs
- Participants agreed that **clinical trials** that engage patients are needed and that clinical trial designs need to be better and include more diverse populations.

Funding and Advocacy Strategies

- Many noted frustrations with the **lack of funding**.
- Many others noted the **limited understanding of the microbiome among urologists (as well as reviewers of journals)**, emphasizing the need for clinician education. In response, some suggested exploring opportunities (presentations, plenary talks, workshops, etc.) at annual AUA and other organizational meetings to introduce the urobiome and engage with urologists.
- The potential for **patient advocacy** and engaging with clinicians to advocate for urobiome funding and research was discussed.

Microbial Metabolism and Function

- Xenobiotics and their impact on the urobiome was discussed. The need for studies on how drugs and dietary factors affect the microbiome are needed.
- Participants agreed on the significant need to understand the **metabolic needs of microbes** and the challenges of designing effective probiotic therapies.
- There was significant discussion about needing **consensus on methods and validated animal and *in vitro* models** for studying host-microbe interactions.
- Some participants emphasized **focusing on functionality** rather than specific organisms in microbiome research – important to understand ***microbial processes* vs. merely the presence of certain species**.

Shareable Data and Resources

- Shareable data and resources is a goal and was articulated by many participants.
- While a suggestion for sharable controls was made, one participant warned against relying on universal control populations and suggested instead to have **minimum standards for controls** in microbiome studies.
- The importance of having **positive and negative controls for every sequencing experiment** to account for batch effects was made.
- Another participant noted that **single-batch sequencing ensures consistent data**.

Diversity and Inclusion in Research

- All agree on the need for **more diverse cohorts in urobiome research** to understand differences across racial, socioeconomic, geographical groups, and other demographic variables.
- Related to above, however, many **challenges of recruiting diverse populations were acknowledged**.

Future Directions and Next Steps

- Collaboration and coordination among researchers is paramount. The need for a **coordinated strategic vision for urobiome research** was agreed upon.
- Possible first/next steps:
  - Small working groups to write larger proposals and facilitate collaboration on big questions in urobiome research
  - Mini-sabbaticals, funded by the Interactions Core, to (a) learn new techniques from each other, (b) design studies, (c) develop suggested methodological approaches, (d) identify resources to be shared across urobiome investigators, (e) create a team to apply for the NIH Transitional Award (supports team-based, bold ideas).
  - Explore funding opportunities from the NIH's Office of the Director and from other funders, such as the Gates Foundation
  - Continue this discussion in future meetings and knowledge exchanges by reserving time after each (or at the end of each)