"Urinary Microbiome Signatures in an Urban Population: Insights from the BEA – Microbiome Study"

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Abstract:

The urinary microbiome is an emerging microbial ecosystem that, although less explored than other body sites, is increasingly recognized for its role in maintaining urogenital homeostasis and contributing to overall health. Its composition can be shaped by multiple external factors, including lifestyle habits and environmental characteristics, elements that have become central to research in urban epidemiology.

This study was conducted as a cross-project effort between the BEA – Bicocca Epidemiological Assessment and the Ecological Transition and Human Wellbeing projects, both part of MUSA – Multilayered Urban Sustainability Action, an Innovation Ecosystem funded by the Ministry of University and Research under the National Recovery and Resilience Plan.

The aim was to investigate how urban environmental features and individual behaviors may influence the urinary microbiome.

To do so, a total of 213 urine samples were collected from residents of the Bicocca district in Milan. After DNA extraction, microbial communities were characterized using amplicon-based high-throughput DNA sequencing to obtain an in-depth profile of the urinary microbiota.

Preliminary analyses revealed substantial interindividual variability. The most abundant genera included *Lactobacillus*, *Streptococcus*, *Corynebacterium*, *Escherichia-Shigella*, *Enterococcus*, and *Gardnerella*, taxa commonly detected in the urogenital tract and often associated with either physiological balance or early cues of dysbiosis depending on their relative abundances. The most prevalent genera - *Corynebacterium*, *Finegoldia*, *Peptoniphilus*, *Winkia*, *Staphylococcus*, *Streptococcus*, and *Enterococcus* - indicate the presence of a shared core urinary microbiome comprising both skin-associated commensals and microorganisms typical of the urogenital niche. Their identification underscores the complexity and ecological stability of the urinary microbiome, as well as its potential susceptibility to environmental and behavioral determinants.

These results reinforce the hypothesis that both urban environmental exposures and lifestyle behaviors may influence the structure of the urinary microbiome. By highlighting these potential interactions, the study lays the groundwork for developing innovative, microbiome-informed strategies to promote health and enhance quality of life in urban settings, in line with the objectives of MUSA and the broader goals of sustainable urban health research.