Renal Tubular Epithelial Cells as Marker of Tubular Damage in Acute Kidney Disease

To the Editor: We read with interest Wagner *et al.*'s[1] report on the development of a flow cytometry assay to quantify proximal and distal tubular epithelial cells (TECs) in urine. By aligning urinary single-cell transcriptomes and surface proteins through Cellular Indexing of Transcriptome and Epitope Sequencing, they applied a marker-based approach to discriminate these cells with high precision. They identified urinary TECs as possible biomarkers for tubular injury in acute kidney injury (AKI).

Urine sediment microscopic examination remains a gold standard for identifying urinary particles,[2] even though it is laborious and has a high analytical variability.[3] Over the past decades, there has been a progressive shift toward automated, high-throughput urinalysis platforms. Recent advances in urinary flow cytometry have enabled more detailed and reproducible classification of urinary elements, particularly distinguishing nonsquamous epithelial cells into renal TECs (RTECs) and transitional epithelial cells.

We recently evaluated[4] whether automated urine particle analysis using the Sysmex UF-5000 analyzer could improve early AKI diagnosis following cardiac surgery by measuring RTEC counts. RTEC counts offer complementary diagnostic value for early AKI detection, with strong diagnostic performance at 12 hours and 24 hours after intensive care unit admission. These results are clinically significant because RTEC detection by urine particle analysis is cost-effective, widely available, and easily integrated into routine diagnosis. Our findings are in line with Wagner *et al.*'s results, which showed that TEC counts correlate well with the severity of AKI.

In addition to AKI, RTEC detection has proven useful for distinguishing upper from lower urinary tract pathology, as shown previously.[5] This finding is crucial, because upper tract conditions such as pyelonephritis or obstruction may cause increased RTECs without true AKI. This underlines the need to interpret RTEC findings in full clinical context to avoid misdiagnosis. Applying urine particle analysis offers the advantage of additional testing for urinary tract infections as a confounder in renal tubular cell analysis.[5]

Although Wagner *et al.* employed advanced marker-based flow cytometry techniques on the basis of single-cell sequencing data, our data show that valuable clinical information can also be generated using general laboratory platforms readily available. Both approaches verify the general principle that urinary TECs represent accessible biomarkers for tubular injury.

1. Wagner L, Kujat J, Langhans V, et al. Flow-cytometric quantification of urine kidney epithelial cells specifically reflects tubular damage in acute kidney diseases. *Kidney Int Rep*. 2025;10:1260–1273. https://doi.org/10.1016/j.ekir.2025.01.037
2. Kouri TT, Hofmann W, Falbo R, et al. The EFLM European urinalysis guideline 2023. *Clin Chem Lab Med*. 2024;62:1653–1786. https://doi.org/10.1515/cclm-2024-0070
3. Oyaert M, Delanghe J. Progress in automated urinalysis. *Ann Lab Med*. 2019;39:15–22. https://doi.org/10.3343/alm.2019.39.1.15
4. Oyaert M, Delanghe J, Brouwers A, et al. Renal tubular epithelial cells as an easily accessible biomarker for diagnosing AKI post cardiac surgery. *Intensive Care Med*. 2025;51:870–882. https://doi.org/10.1007/s00134-025-07909-x
5. Oyaert M, Speeckaert M, Boelens J, Delanghe JR. Renal tubular epithelial cells add value in the diagnosis of upper urinary tract pathology. *Clin Chem Lab Med*. 2020;58:597–604. https://doi.org/10.1515/cclm-2019-1068

Matthijs Oyaert[1], Sigurd Delanghe[2], Joris Delanghe[3], Eric Hoste[4,5,6] and Marijn Speeckaert[2,5,6]

[1]Department of Laboratory medicine, Ghent University Hospital, Ghent, Belgium; [2]Department of Nephrology, Ghent University Hospital, Ghent, Belgium; [3]Department of Diagnostic Sciences, Ghent University, Ghent, Belgium; [4]Department of Intensive Care Medicine, Ghent University Hospital, Ghent, Belgium; [5]Research Foundation Flanders, Brussels, Belgium; and [6]Department of Internal Medicine and Pediatrics, Ghent University Hospital, Ghent, Belgium

Correspondence: Matthijs Oyaert, Department of Laboratory Medicine, Ghent University Hospital, C. Heymanslaan 10, 9000 Ghent, Belgium. E-mail: matthijs.oyaert@uzgent.be

Received 9 May 2025; accepted 19 May 2025; published online 9 June 2025

Kidney Int Rep (2025) **10,** 2881; https://doi.org/10.1016/j.ekir.2025.05.052