

Supplementary Information

A Passive Mixing Microfluidic Urinary Albumin Chip for Chronic Kidney Disease Assessment

Jiandong Wu, † Dumitru Tomsa, † Michael Zhang, ‡ Paul Komenda, ‡ Navdeep Tangri, ‡ Claudio Rigatto, ‡ Francis Lin*†

†Department of Physics and Astronomy, University of Manitoba, Winnipeg, MB, R3T 2N2, Canada

‡Seven Oaks General Hospital, Winnipeg, MB, R2V 3M3, Canada

* E-mail: francis.lin@umanitoba.ca

Table S1. The albumin levels from the UAL-Chip and measurements from the clinical tests in 12 CKD patients.

Patient	Urine Albumin ($\mu\text{g/ml}$) UAL-Chip	Urine Albumin ($\mu\text{g/ml}$) Clinical test	Urine Creatinine (mmol/L) Clinical test	UACR (mg/mmol) Clinical test	eGFR (ml/min/1.73m^2) Clinical test
1	320.22	766.5	4.2	182.5	20
2	11.80838	35.75	14.3	2.5	31
3	962.2985	639.75	7.5	85.3	100
4	120.1402	133.98	8.7	15.4	21
5	448	487.32	9.3	52.4	23
6	2428	1167.27	3.9	299.3	30
7	162	17.7	5.7	3.1	51
8	101	80.08	8.8	9.1	27
9	2727	1360.32	2.4	566.8	36
10	2889	4399.85	6.5	676.9	14
11	2842	1214.44	9.7	125.2	28
12	2099	1117.44	4.8	232.8	8

Table S2. The cross-tabulation table for pairs of albumin positivity level ≥ 20 $\mu\text{g/ml}$ (UAL-Chip) and the reference standard of an UACR ≥ 3 mg/mmol .

	UACR ≥ 3 mg/mmol		
Albumin > 20 $\mu\text{g/ml}$ (UAL-Chip)	Positive	Negative	Total
Positive	11	0	11
Negative	0	1	1
Total	11	1	12

Table S3. The cross-tabulation table for pairs of albumin positivity level ≥ 200 $\mu\text{g/ml}$ (UAL-Chip) and the reference standard of an UACR ≥ 30 mg/mmol .

	UACR ≥ 30 mg/mmol		
Albumin > 200 $\mu\text{g/ml}$ (UAL-Chip)	Positive	Negative	Total
Positive	8	0	8
Negative	0	4	4
Total	8	4	12

Figure S1. Illustration of two prototype portable imaging systems. (a) Assembly of a USB microscope-based imaging system. An array of green LEDs was used as the excitation light source. The filter, LED array, and USB microscope (AD4113T, Dino-Lite) were assembled using a 3D printed housing module. When performing the test, the microfluidic device was directly put under the module; (b) The UAL-Chip channel filled with the Texas Red dye imaged by the USB microscope system; (c) The fluorescent images of different dilutions of the Texas Red dye in the detection zone; (d) The linear relationship between the concentration of the Texas Red dye and the measured signal intensity; (e) The assembly of a smartphone-based imaging system; (f) The fluorescent image of the Texas Red dye in the detection zone of the UAL-Chip taken by the smartphone imaging system. The excitation source in this system is a laser diode, thus the background signal is weaker than the USB microscope system using the LED array.

