

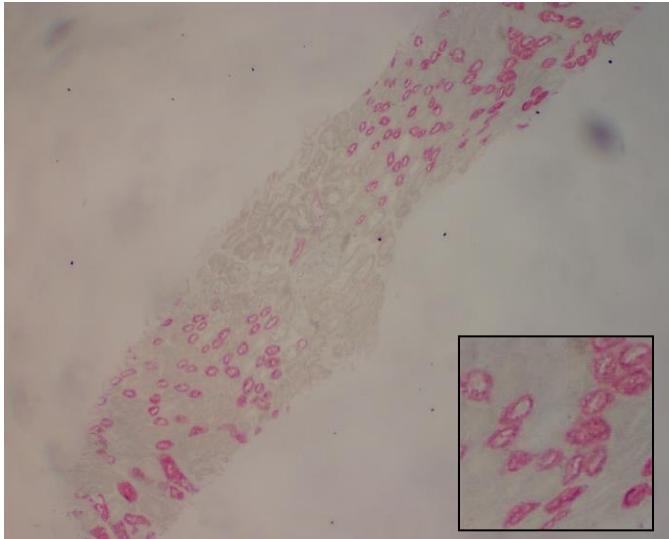
## Supplementary Appendix

**Figure S1. Enrollment of Deceased Kidney Donors and Recipients into the Study Cohort**

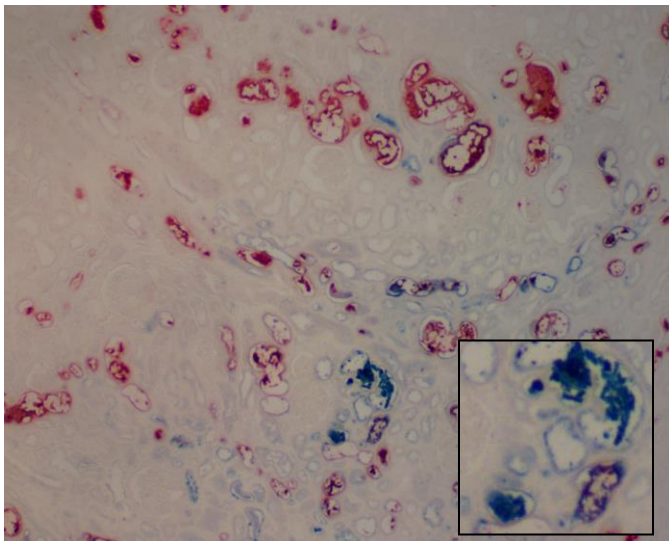


**Figure S2.** Dual Staining of UMOD and OPN from Deceased Donor Biopsies by kidney injury status

**A.** Control



**B.** Deceased Donor Biopsy with Acute Tubular Injury



**Legend:** Dual stain for UMOD (**red**) and OPN (**teal**) shows limited staining in UMOD mostly in the loop of Henle in control tissues and OPN is negative (n=4) (Panel A). Tubular casts and injured tubules including, proximal tubules and loop of Henle stain for OPN and UMOD in donor biopsies showing acute tubular injury (n=6) (Panel B). 40x, insets show zoom.

**Table S1a. Donor Characteristics by Tertiles of Uromodulin**

Donor Characteristics	Tertiles of Uromodulin			P-value
	Lower (31-1248 ng/mL) N=439	Middle (1248-3052 ng/mL) N=434	Upper (3065-40 400 ng/mL) N=425	
Age, years	40.7 (14.6)	41.9 (14.7)	41.8 (14.3)	0.33
Male	253 (58%)	255 (59%)	276 (65%)	0.06
Black race	68 (15%)	72 (17%)	65 (15%)	0.85
Hispanic ethnicity	44 (10%)	50 (12%)	77 (18%)	<0.001
BMI, kg/m <sup>2</sup>	28.5 (7.1)	27.8 (6.8)	28.9 (7.8)	0.15
Hypertension	134 (31%)	141 (32%)	124 (29%)	0.57
Diabetes	54 (12%)	37 (9%)	39 (9%)	0.14
Cause of death				
Head trauma	145 (34%)	125 (30%)	126 (30%)	0.18
Anoxia	143 (34%)	134 (32%)	148 (35%)	
Stroke	134 (32%)	156 (37%)	137 (33%)	
Other	3 (1%)	5 (1%)	10 (2%)	
Hepatitis C	18 (4%)	20 (5%)	10 (2%)	0.19
ECD	78 (18%)	98 (23%)	70 (16%)	0.05
DCD	31 (7%)	57 (13%)	118 (28%)	<0.001
KDPI based on KDRI	48.5 (27.1)	48.4 (28.5)	47.8 (26.5)	0.92
Days from admission to death	4.1 (5.3)	4.6 (3.9)	6.5 (9.4)	<0.001
Admission SCr, mg/dL	1.2 (0.6)	1.1 (0.5)	1.1 (0.7)	<0.001
Terminal SCr, mg/dL	1.4 (1.2)	1.1 (0.7)	1.0 (0.5)	<0.001
Donor AKIN stage				
No AKI	291 (66%)	342 (79%)	343 (81%)	<0.001
Stage 1	90 (21%)	62 (14%)	59 (14%)	
Stage 2	27 (6%)	20 (5%)	15 (4%)	
Stage 3	31 (7%)	10 (2%)	8 (2%)	
Number of discard				
0	371 (85%)	376 (87%)	385 (91%)	0.03
1	68 (15%)	58 (13%)	40 (9%)	

Values are means (SD) or n (%).

Abbreviations: AKI, acute kidney injury; BMI, body mass index; DCD, donation after cardiovascular determination of death; ECD, expanded-criteria donor; ESKD, end-stage kidney disease; HLA, human leukocyte antigen; KDRI, kidney donor risk index; KDPI, kidney donor profile index.

**Table S1b. Donor Characteristics by Tertiles of Osteopontin**

Donor Characteristics	Tertiles of Osteopontin			P-value
	Lower (53-808 ng/mL) N=433	Middle (809-2445 ng/mL) N=433	Upper (2448-46 100 ng/mL) N=432	
Age, years	40.7 (14.3)	41.7 (14.6)	41.9 (14.7)	0.41
Male	234 (54%)	278 (64%)	272 (63%)	0.004
Black race	77 (18%)	58 (13%)	70 (16%)	0.20
Hispanic ethnicity	63 (15%)	59 (14%)	49 (11%)	0.36
Body mass index, kg/m <sup>2</sup>	28.6 (6.8)	28.1 (6.9)	28.5 (8.0)	0.24
Hypertension	126 (29%)	139 (32%)	134 (31%)	0.63
Diabetes	48 (11%)	47 (11%)	35 (8%)	0.27
Cause of death				
Head trauma	127 (31%)	132 (31%)	137 (32%)	
Anoxia	153 (37%)	134 (32%)	138 (32%)	
Stroke	133 (32%)	149 (35%)	145 (34%)	0.46
Other	3 (1%)	9 (2%)	6 (1%)	
Hepatitis C	13 (3%)	16 (4%)	19 (4%)	0.55
ECD	70 (16%)	82 (19%)	94 (22%)	0.11
DCD	51 (12%)	75 (17%)	80 (19%)	0.02
KDPI based on KDRI	46.4 (27.8)	48.1 (27.4)	50.3 (26.8)	0.11
Days from admission to death	6.1 (9.1)	4.8 (5.0)	4.28 (5.1)	<0.001
Admission SCr, mg/dL	1.1 (0.8)	1.1 (0.4)	1.1 (0.5)	0.68
Terminal Scr, mg/dL	1.1 (0.9)	1.1 (0.8)	1.3 (0.9)	<0.001
Donor AKIN stage				
No AKI	341 (79%)	334 (77%)	301 (70%)	
Stage 1	68 (16%)	61 (14%)	82 (19%)	
Stage 2	8 (2%)	22 (5%)	32 (7%)	0.003
Stage 3	16 (4%)	16 (4%)	17 (4%)	
Number of discard				
0	377 (87%)	377 (87%)	378 (88%)	
1	56 (13%)	56 (13%)	54 (13%)	0.98

Values are means (SD) or n (%).

Abbreviations: AKI, acute kidney injury; BMI, body mass index; DCD, donation after cardiovascular determination of death; ECD, expanded-criteria donor; ESKD, end-stage kidney disease; HLA, human leukocyte antigen; KDRI, kidney donor risk index; KDPI, kidney donor profile index.

**Table S2a. Recipient Characteristics by Tertiles of Uromodulin**

Recipient Characteristics	Tertiles of Donor Uromodulin Levels			P-value
	Lower (31-1248 ng/mL) N=810	Middle (1248-3052 ng/mL) N=810	Upper (3065-40 400 ng/mL) N=810	
Age, years	53.6 (14.6)	52.77 (15.09)	52.37 (14.8)	0.13
Male	483 (60%)	505 (62%)	504 (62%)	0.45
Black race	324 (40%)	306 (38%)	326 (40%)	0.53
Hispanic ethnicity	83 (10%)	89 (11%)	107 (13%)	0.15
Body mass index, kg/m <sup>2</sup>	27.9 (5.7)	28.1 (5.9)	28.1 (5.7)	0.70
Cause of ESKD				
Unknown/other	173 (21%)	163 (20%)	160 (20%)	0.55
Diabetes	254 (31%)	244 (30%)	228 (28%)	
Hypertension	212 (26%)	218 (27%)	213 (26%)	
Glomerulonephritis	116 (14%)	133 (16%)	142 (18%)	
Graft failure	55 (7%)	52 (6%)	67 (8%)	
ESKD duration, months	44.2 (40.3)	44.9 (36.8)	48.5 (37.0)	0.01
Preemptive transplant	95 (12%)	102 (13%)	77 (10%)	0.13
Previous transplant	99 (12%)	102 (13%)	114 (14%)	0.50
Recipient transfusions				
No	616 (76%)	600 (74%)	628 (78%)	0.41
Unknown	49 (6%)	58 (7%)	41 (5%)	
Yes	145 (18%)	152 (19%)	141 (17%)	
Candidate most recent PRA	20.8 (35.2)	21.6 (34.7)	22.1 (35.6)	0.58
Recipient PRA categories				
0%	529 (65%)	506 (62%)	510 (63%)	
1-20%	59 (7%)	58 (7%)	61 (8%)	
21-80%	92 (11%)	125 (15%)	109 (13%)	
>80%	130 (16%)	121 (15%)	130 (16%)	
Kidney biopsied	357 (44%)	390 (48%)	370 (46%)	0.25
Kidney pumped	224 (28%)	309 (38%)	419 (52%)	<0.001
Cold ischemia time, hours	14.8 (7.1)	14.9 (7.1)	16.2 (7.0)	<0.001
HLA mismatch level	4.1 (1.6)	4.3 (1.5)	4.3 (1.5)	0.02
Donor AKIN stage				
No AKI	547 (68%)	637 (79%)	661 (82%)	<0.001
Stage 1	166 (20%)	117 (14%)	108 (13%)	
Stage 2	43 (5%)	37 (5%)	29 (4%)	
Stage 3	54 (7%)	19 (2%)	12 (1%)	

Values are means (SD) or n (%).

Abbreviations: HLA, human leukocyte antigen; AKIN, Acute Kidney Injury Network; AKI, acute kidney injury; ESKD, end-stage kidney disease; PRA, panel reactive antibodies.

**Table S2b: Recipient Characteristics by Tertiles of Osteopontin**

Recipient Characteristics	Tertiles of Donor Osteopontin Levels			P-value
	Lower (53-808 ng/mL) N=810	Middle (809-2445 ng/mL) N=810	Upper (2448-46,100 ng/mL) N=810	
Age, years	51.9 (15.3)	53.6 (15.0)	53.3 (14.2)	0.05
Male	490 (60%)	491 (61%)	511 (63%)	0.48
Black race	316 (39%)	301 (37%)	339 (42%)	0.15
Hispanic ethnicity	93 (11%)	89 (11%)	97 (12%)	0.82
Body mass index, kg/m <sup>2</sup>	28.2 (5.9)	28.0 (5.7)	28.0 (5.7)	0.86
Cause of ESKD				
Unknown/other	168 (21%)	160 (20%)	168 (21%)	
Diabetes	230 (28%)	255 (31%)	241 (30%)	
Hypertension	203 (25%)	212 (26%)	228 (28%)	0.53
Glomerulonephritis	142 (18%)	127 (16%)	122 (15%)	
Graft failure	67 (8%)	56 (7%)	51 (6%)	
ESKD duration, months	47 (39.5)	43.7 (36.8)	46.8 (37.8)	0.14
Preemptive transplant	83 (10%)	104 (13%)	87 (11%)	0.22
Previous transplant	118 (15%)	95 (12%)	102 (13%)	0.22
Recipient transfusions				
No	613 (76%)	615 (76%)	616 (76%)	
Unknown	52 (6%)	48 (6%)	48 (6%)	0.99
Yes	145 (18%)	147 (18%)	146 (18%)	
Candidate most recent PRA	23.0 (36.5)	21.5 (35.0)	20.0 (33.9)	0.79
Recipient PRA categories				
0%	520 (64%)	510 (63%)	515 (64%)	
1-20%	42 (5%)	63 (8%)	73 (9%)	0.07
21-80%	107 (13%)	115 (14%)	104 (13%)	
>80%	141 (17%)	122 (15%)	118 (15%)	
Kidney biopsied	348 (43%)	377 (47%)	392 (48%)	0.08
Kidney pumped	292 (36%)	325 (40%)	335 (41%)	0.07
Cold ischemia time, hours	14.2 (6.7)	15.5 (7.2)	16.1 (7.3)	<0.001
HLA mismatch level	4.1 (1.6)	4.2 (1.5)	4.3 (1.4)	0.03
Donor AKIN stage				
No AKI	649 (80%)	630 (78%)	566 (70%)	
Stage 1	123 (15%)	114 (14%)	154 (19%)	
Stage 2	12 (1%)	39 (5%)	58 (7%)	<0.001
Stage 3	26 (3%)	27 (3%)	32 (4%)	

Values are means (SD) or n (%).

Abbreviations: AKI, acute kidney injury; AKIN, Acute Kidney Injury Network; ESKD, end-stage kidney disease; HLA, human leukocyte antigen; PRA, panel reactive antibodies; SCr, serum creatinine.

**Table S3a. Donor Characteristics in the Training and Test Dataset**

<b>Donor Characteristics</b>	<b>Test Dataset (N=1215)</b>	<b>Training Dataset (N=1215)</b>	<b>P-value</b>
Age	40.7 (14.6)	41.0 (14.5)	0.68
Hispanic ethnicity	154 (13%)	174 (14%)	0.24
Black race	193 (16%)	193 (16%)	1
Male	743 (61%)	738 (61%)	0.84
Body mass index, kg/m <sup>2</sup>	28.3 (7.4)	28.3 (7.0)	0.81
Hypertension	342 (28%)	368 (30%)	0.25
Diabetes	114 (9%)	113 (9%)	0.94
Donor donation after cardiac death	176 (14%)	212 (17%)	0.05
Expanded-criteria donor	209 (17%)	218 (18%)	0.63
Hepatitis C virus	43 (4%)	31 (3%)	0.16
Cause of death			
Head trauma	395 (33%)	370 (31%)	
Anoxia	392 (33%)	397 (34%)	0.73
Stroke	383 (32%)	399 (34%)	
Other	16 (1%)	18 (2%)	
Days from admission to death	5.0 (7.2)	5.2 (6.5)	0.07
Admission SCr, mg/dL	1.1 (0.6)	1.1 (0.6)	0.12
Terminal SCr, mg/dL	1.1 (0.8)	1.2 (0.9)	0.76
KDRI	1.3 (0.4)	1.3 (0.4)	0.32
KDPI	46.3 (27.4)	47.4 (26.9)	0.33
Number of kidneys transplanted			
1	70 (6%)	96 (8%)	0.04
2	1145 (94%)	1119 (92%)	
AKIN Stage			
No AKI	937 (77%)	908 (75%)	
Stage 1	199 (16%)	192 (16%)	0.04
Stage 2	48 (4%)	61 (5%)	
Stage 3	31 (3%)	54 (4%)	

Values are means (SD) or n (%).

Abbreviations: AKI, acute kidney injury; AKIN, Acute Kidney Injury Network; KDPI, Kidney Donor Profile Index; KDRI, Kidney Donor Risk Index; SCr, serum creatinine.



**Table S3b. Recipient Characteristics in the Training and Test Dataset**

<b>Recipient Characteristics</b>	<b>Test Dataset (N=1215)</b>	<b>Training Dataset (N=1215)</b>	<b>P-value</b>
Age	52.4 (15.1)	53.4 (14.6)	0.12
Hispanic ethnicity	136 (11%)	143 (12%)	0.66
Black race	495 (41%)	461 (38%)	0.16
Male	747 (61%)	745 (61%)	0.93
Body mass index, kg/m <sup>2</sup>	28.0 (5.7)	28.1 (5.8)	0.52
Previous transplant	157 (13%)	158 (13%)	0.95
ESKD duration, months	45.4 (37.2)	46.3 (39.0)	0.47
ESKD cause			
Other or unknown	272 (22%)	224 (18%)	
Diabetes	350 (29%)	376 (31%)	
Hypertension	310 (26%)	333 (27%)	0.17
Glomerulonephritis	196 (16%)	195 (16%)	
Graft failure	87 (7%)	87 (7%)	
Preemptive transplant	143 (12%)	131 (11%)	0.44
Pre-transplant transfusions	225 (19%)	213 (18%)	0.53
Recipient HLA	4.2 (1.6)	4.2 (1.5)	0.41
Candidate most recent calculated PRA	19.9 (34.1)	23.1 (36.1)	0.11
PRA categories (%)			
0%	786 (65%)	759 (62%)	
1-20%	98 (8%)	80 (7%)	
21-80%	154 (13%)	172 (14%)	0.16
>80%	177 (15%)	204 (17%)	
Primary insurance type			
Medicaid & Medicare	896 (74%)	918 (76%)	0.31
Private insurance	319 (26%)	297 (24%)	
Kidney pumped	454 (37%)	498 (41%)	0.07
Pre-transplanted dialysis	1072 (88%)	1084 (89%)	0.44
Cold ischemia time, hours	15.3 (6.9)	15.3 (7.3)	0.83
Kidney biopsied	546 (45%)	571 (47%)	0.31
Kidney graft failed	161 (13%)	152 (13%)	0.59
Kidney survival time, days	1423.9 (590.5)	1425.7 (593.9)	0.88

Values are means (SD) or n (%).

Abbreviations: ESKD, end-stage kidney disease; HLA, human leukocyte antigen; PRA, panel reactive antibodies.

**Table S4. Summary Table of Biopsy Cohort of Deceased Donors**

	Age	Sex	Serum creatinine* (mg/dL)	Histologic Findings/Dx
Acute tubular injury (n=6)	17	M	7.2	-
	57	F	3.1	-
	24	F	6.4	Pulmonary embolism
	27	M	4.2	Overdose
	41	F	3.3	Myocardial infarction
	30	F	2.7	-
No acute tubular injury (n=4)	43	F	0.9	recurrent nephrotic syndrome
	48	M	0.8	unremarkable allograft
	51	M	1.2	glomerulomegaly/focal segmental glomerulosclerosis
	55	F	1.1	lupus nephritis (class III)

\*Admissions serum creatinine reported for donors without acute tubular injury and terminal serum creatinine reported for donors with acute tubular injury