

Noninvasive Immunohistochemical Diagnosis and Novel *MUC1* Mutations Causing
Autosomal Dominant Tubulo-Interstitial Kidney Disease

Supplementary Material

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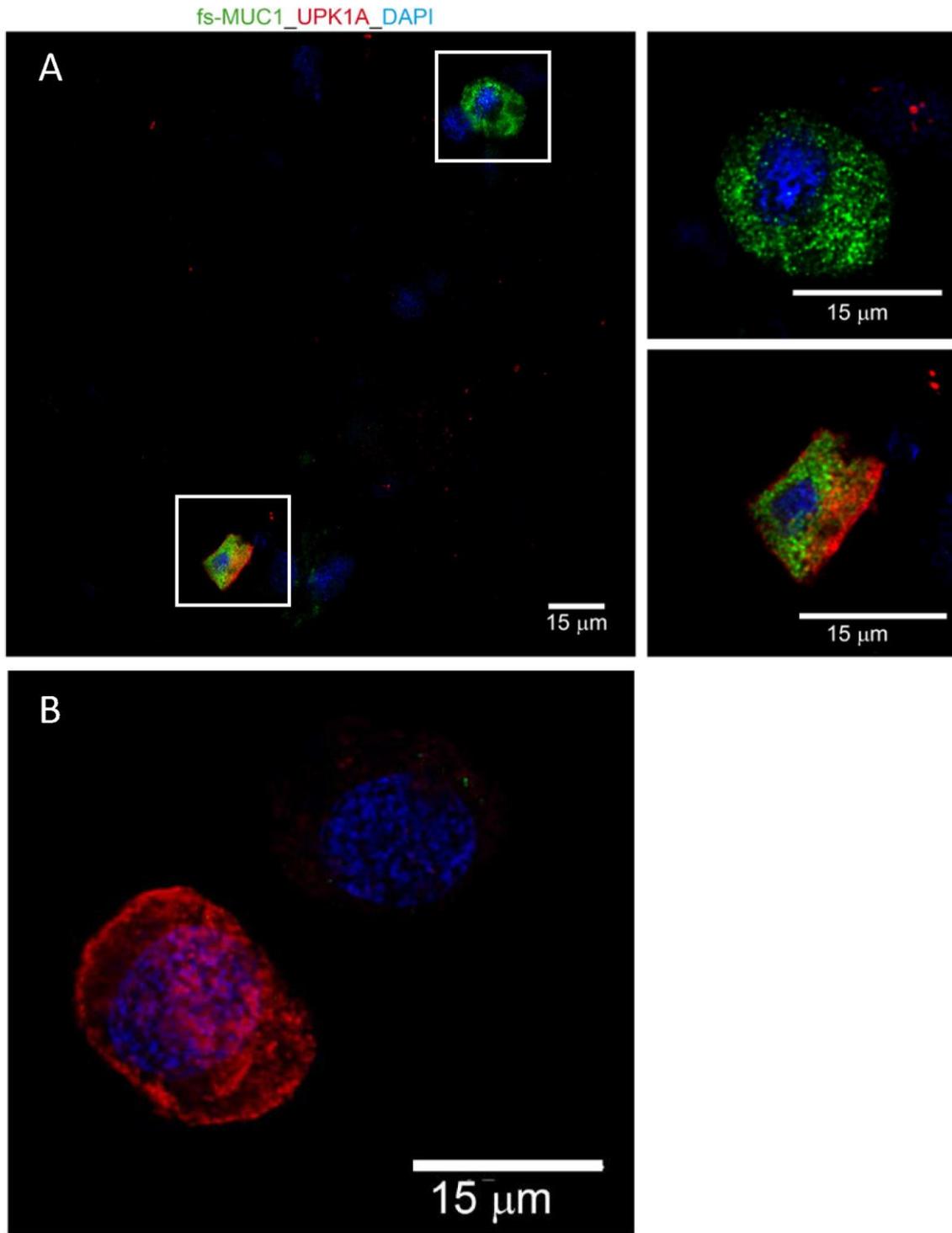
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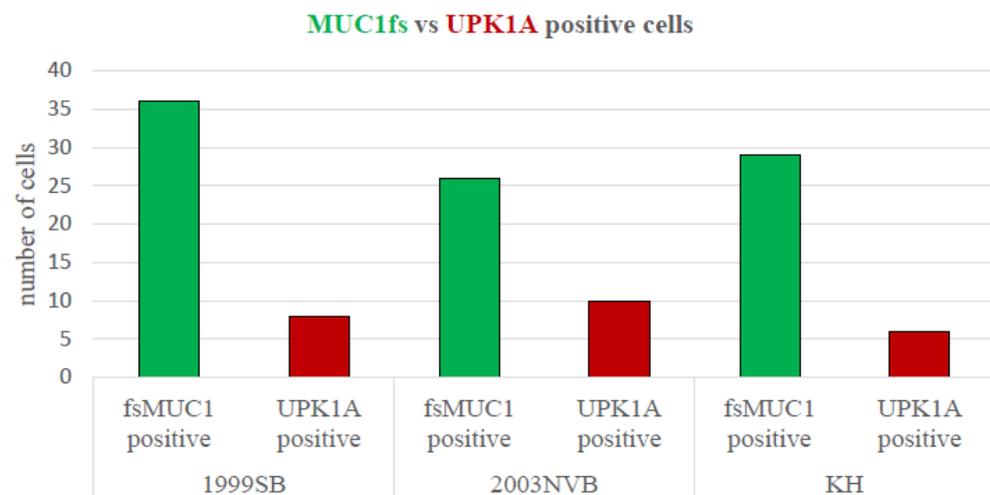
Supplementary Table 1. Diagnostic assessment of MUC1fs immunohistochemical staining of kidney and epithelial tissue biopsies. All ADTKD-*MUC1* samples were from individuals who had been genetically tested and found to have the *MUC1* 27dupC mutation. Controls were from individuals with a genetic diagnosis of ADTKD-*UMOD*.

Tissue	Condition	N	Expected positive	Actual positive
Kidney	ADTKD- <i>MUC1</i>	12	12	11
	ADTKD- <i>UMOD</i>	11	0	2
Skin	ADTKD- <i>MUC1</i>	2	2	2
	ADTKD- <i>UMOD</i>	1	0	1
Breast	ADTKD- <i>MUC1</i>	3	3	3
Lung	ADTKD- <i>MUC1</i>	1	1	1
Colon	ADTKD- <i>MUC1</i>	1	1	1
	ADTKD- <i>UMOD</i>	2	0	0
Fallopian Tube	ADTKD- <i>MUC1</i>	1	1	1
Total non-kidney epithelial	ADTKD- <i>MUC1</i>	8	8	8
	ADTKD- <i>UMOD</i>	3	0	1

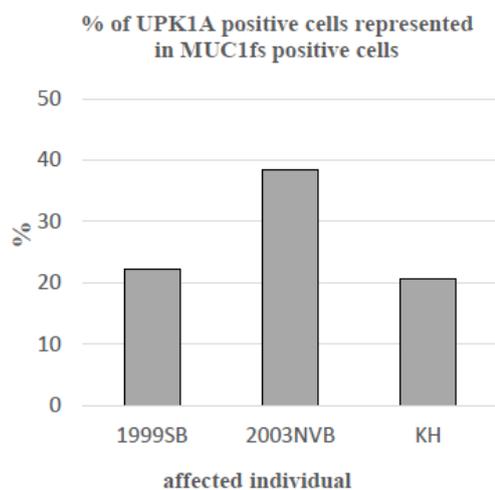


Supplementary Figure 1. Immunofluorescence images of urinary cells stained for MUC1fs (green); UPK1A, a marker of umbrella cells of urinary bladder (red) and DAPI (blue). (A) Urinary cell positive only for MUC1fs and cells positive for MUC1fs and UPK1A present in ADTKD-*MUC1* patient with 27dupC; detailed images of these cells are shown in right. (B) Urinary cell positive only for UPK1A in a healthy control.

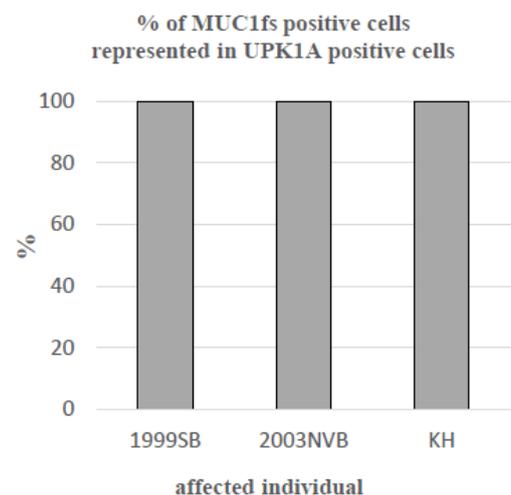
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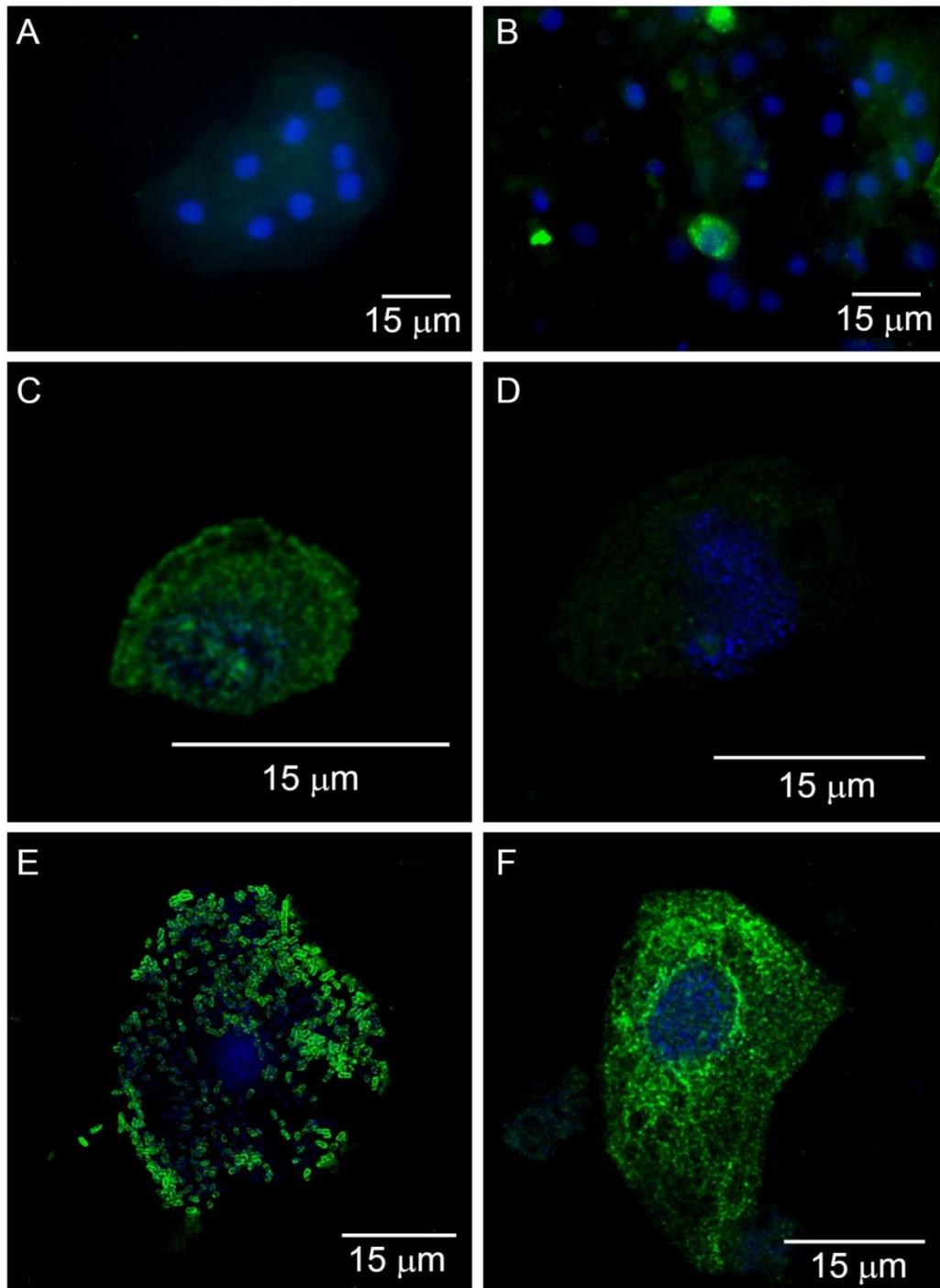
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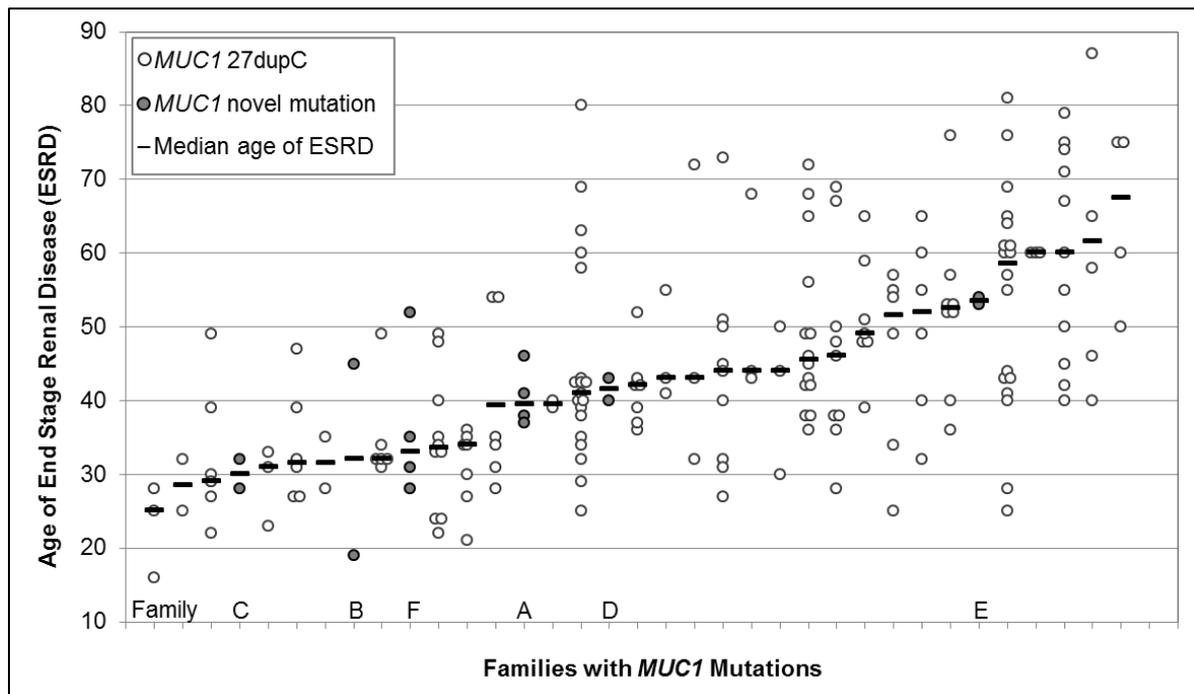
Supplementary Figure 2. MUC1fs positive and UPK1A positive cells in urinary cell smears. A. Number of cells positive for fsMUC1 and UPK1A. B. Approximately 30% of MUC1fs positive cells are also positive for UPK1A. C. All UPK1A positive cells are positive for MUC1fs. UPK1A is expressed mainly by umbrella cells of urinary bladder. These results suggest that approximately 30% of MUC1fs cells are of urinary bladder origin. The percentages of MUC1fs and MUC1fs +UPK1A double positive cells were calculated from three ADTKD-*MUC1* patients with 27dupC.



Supplementary Figure 3. False negativity and false positivity in detection of MUC1fs.

Urinary pellets were smeared on glass slides, then fixed and stained with anti-MUC1fs antibodies. Confocal images show DAPI (blue) and MUC1fs (green). (A) Negative immunostaining of MUC1fs in a patient with *MUC1* 27dupC due to low amount of urinary cells. (B) This issue was resolved in the same individual upon repeated urinary cell collection and analysis. (C) False positivity of staining in urinary cells from patient with ADTKD-*UMOD*. (D) Not all ADTKD-*UMOD* showed positivity of MUC1fs staining. (E) False positive MUC1fs staining due to bacterial contamination compare to (F) diagnostic MUC1fs staining in ADTKD-*MUC1* patient with 27dupC.

Novel *MUC1* Mutations Causing ADTKD



Supplementary Figure 4. Age of ESRD in families with *MUC1* mutations. Each column represents a family with a pathogenic mutation in *MUC1*. Each circle represents an individual in the family who has reached ESRD. White circles represent families with a *MUC1* 27dupC mutation; gray circles represent families with a novel *MUC1* mutation. The short black lines represent the median age for ESRD for each family.