

Uraemic toxins by class and linkage with clinical symptoms and outcomes

Classification of Molecules ¹		Representative Molecules ^{1,7,13}		Relevant Clinical Effects		Dialytic Clearance ¹			
Small Molecules <0.5 kDa		Urea	(60 Da)	General Uraemic Toxicity ^{2,3}		Removed by Low-Flux HD	Removed by High-Flux HD	Removed by High-Flux HDF	Removed by HDx therapy enabled by MCO
		Phosphate	(96 Da)	Vascular Calcification ⁴ Chronic Kidney Disease-Mineral and Bone Disorder ⁵					
Small-middle Molecules 0.5-15 kDa		PTH	(9.5 kDa)	Chronic Kidney Disease-Mineral and Bone Disorder ⁵					
		Beta 2 microglobulin	(12 kDa)	Amyloidosis/CTS* ^{2,3}					
Medium-middle Molecules >15-25 kDa		Myoglobin	(17 kDa)	Oxidative Stress & Mitochondrial Dysfunction ³					
		Kappa free-light-chains	(23 kDa)	Multiple Toxicity ^{3,6}					
		Complement factor D	(24 kDa)	Contributor to Proinflammatory Status of Uremia ⁷					
		Interleukin-6	(25 kDa)	Pruritus ⁸ , Recovery Time ⁹ , Chronic Inflammation ¹⁰ , CV Disease ¹⁰ , Protein-Energy Wasting in CKD ¹⁰					
Large-middle Molecules >25-58 kDa		TNF-alpha	(26 kDa)	Sepsis ³ , Chronic Inflammation ¹⁰ , CV Disease ¹⁰ , Protein-Energy Wasting in CKD ¹⁰					
		FGF-23	(32 kDa)	Secondary Immunodeficiency, CV Disease ¹⁰					
		Alpha 1 microglobulin	(33 kDa)	Restless Legs Syndrome (RLS) ^{4,11}					
		YKL-40	(40 kDa)	Inflammation ¹²					
		Lambda free-light-chains	(45 kDa)	Chronic Inflammation, Secondary Immunodeficiency ¹⁰					
Large Molecules [>58 kDa]		Albumin	(67 kDa)	Toxin Binding ³					

*CTS = Carpal Tunnel Syndrome

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