

Uremic 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 Uremic Toxicity ^{2,3}	Removed by Low-Flux HD
	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	Removed by High-Flux HD
	Beta 2 microglobulin [12 kDa]	Amyloidosis/CTS* ^{2,3}	
Medium-middle Molecules >15-25 kDa	Myoglobin [17 kDa]	Oxidative Stress & Mitochondrial Dysfunction ³	Removed by High-Flux HDF
	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	Removed by HDx therapy enabled by MCO membrane
	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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