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## A Porphyrin-PEG Polymer with Rapid Renal Clearance

Haoyuan Huang<sup>a,b</sup>, Reinier Hernandez<sup>c</sup>, Jumin Geng<sup>a</sup>, Haotian Sun<sup>b</sup>, Wentao Song<sup>a</sup>, Feng Chen<sup>c</sup>, Stephen A Graves<sup>c</sup>, Robert J Nickles<sup>c</sup>, Chong Cheng<sup>b</sup>, Weibo Cai<sup>c</sup>, Jonathan F Lovell<sup>a,b\*</sup>

<sup>a</sup>Department of Biomedical Engineering, University at Buffalo, State University of New York, Buffalo, NY, USA

<sup>b</sup>Department of Chemical and Biological Engineering, University at Buffalo, State University of New York, Buffalo, NY, USA

<sup>c</sup>Department of Radiology and Medical Physics, University of Wisconsin, Madison, WI, USA

\*correspondence: jflovell@buffalo.edu

### Abstract

Tetracarboxylic porphyrins and polyethylene glycol (PEG) diamines were crosslinked in conditions that gave rise to a water-soluble porphyrin polyamide. Using PEG linkers 2 kDa or larger prevented fluorescence self-quenching. This networked porphyrin mesh was retained during dialysis with membranes with a 100 kDa pore size, yet passed through the membrane when centrifugal filtration was applied. Following intravenous administration, the porphyrin mesh, but not the free porphyrin, was rapidly cleared via renal excretion. The process could be monitored by fluorescence analysis of collected urine, with minimal background due to the large Stokes shift of the porphyrin (230 nm separating excitation and emission peaks). In a rhabdomyolysis mouse model of renal failure, porphyrin mesh urinary clearance was significantly impaired. This led to slower accumulation in the bladder, which could be visualized non-invasively via fluorescence imaging. Without further modification, the porphyrin mesh was chelated with <sup>64</sup>Cu for dynamic whole body positron emission tomography imaging of renal clearance. Together, these data show that small porphyrin-PEG polymers can serve as effective multimodal markers of renal function.

**Keywords:** Porphyrin; Polyamide; fluorescence imaging; positron emission tomography; renal clearance; acute renal failure

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