

Original Article

Elevation of Urinary Adipsin in Preeclampsia  
Correlation With Urine Protein Concentration and the Potential Use for a  
Rapid Diagnostic Test

Tao Wang,\* Rong Zhou,\* Linbo Gao, Yanyun Wang, Changping Song, Yunhui Gong, Jin Jia,  
Wei Xiong, Li Dai, Lin Zhang, Huaizhong Hu

**Abstract**—Early diagnosis and treatment of preeclampsia are essential for prevention of seizure development and fetus maturation. Although various methods have been developed for predicting or monitoring the onset of preeclampsia, a simple assay that can be used as a home or point of care test remains unavailable. We attempted to find a urinary protein that could be used as a biomarker for developing such a test. Urinary samples were collected from 124 preeclampsia and 135 healthy pregnant women for screening using a protein array technology and quantification by ELISA. A urinary protein, adipsin, was found significantly increased, and the adipsin creatinine ratio was closely correlated with the urinary 24-hour protein in patients with preeclampsia. When combined with the increased diastolic blood pressure ( $\geq 90$  mm Hg), the sensitivity was 90.3% and the specificity reached 100.0% for preeclampsia diagnosis. We then developed a laminar flow immunoassay for rapid diagnosis, and the sensitivity and specificity were 89.04% and 100%, respectively, when combined with increased diastolic blood pressure. Because of the easiness of sample collection, assay conduction, and result interpretation, this urine test can be potentially used as a home test for monitoring preeclampsia onset for high-risk pregnant women and as a rapid test for a preliminary diagnosis for emergency patients at hospitals. (*Hypertension*. 2014;64:00-00.) • [Online Data Supplement](#)

**Key Words:** preeclampsia ■ protein creatinine ratio ■ urinary adipsin ■ urinary protein ■ urinary rapid test

Preeclampsia, a devastating pregnancy-specific syndrome complicating 2% to 8% of pregnancies, is responsible for  $\approx 60000$  maternal deaths worldwide every year. It is characterized by new-onset hypertension, proteinuria, and edema and usually develops after 20 weeks of gestation.<sup>1,2</sup> Early diagnosis and treatment of preeclampsia is essential for prevention of seizure development and maintaining the fetus in the uterus to mature. Many attempts have been made to meet these purposes. It has been found that altered concentration of soluble fms-like tyrosine kinase 1 (sFlt-1) and placental growth factor (PlGF) can predict the occurrence of preeclampsia weeks before the appearance of the clinical symptoms.<sup>3-6</sup> Uterine artery Doppler studies that assess the pulsability index reveal increased uterine vascular resistance well before the preeclampsia clinical signs arise.<sup>7</sup> These predictive tests are valuable for identifying high-risk pregnant women but are incapable of conveniently monitoring the exact occurrence of the disease. In this study, we assumed that in preeclampsia a urinary protein that closely correlated with the 24-hour urine protein could be identified with advanced proteomics technologies and could be developed as a

simple rapid assay for point-of-care use and for home monitoring as well.

In 1843, John Lever of Guy's Hospital in London discovered the presence of albumin by boiling the urine from pregnant women with puerperal convulsions.<sup>8</sup> Proteinuria in preeclampsia since then has been studied extensively. The glomerular injury that results in proteinuria is characterized as endotheliosis, manifested as glomerular endothelial swelling with loss of endothelial fenestrae and occlusion of the capillary lumens.<sup>9,10</sup> Proteinuria is measured currently by a 24-hour urine protein determination or a dipstick examination on a random urine sample. The 24-hour urine protein quantification is no doubt the most accurate and reliable approach but is time consuming and inconvenient. Dipstick is semiquantitative, easy to use, quick, and inexpensive. However, many studies have reported a poor correlation between the dipstick examination and the 24-hour urine assay with high false-positive or false-negative rates.<sup>11,12</sup>

We aimed to find a urine protein in preeclampsia that closely correlated with the 24-hour urine protein and was at a

Received October 24, 2013; first decision November 23, 2013; revision accepted June 5, 2014.

From the Laboratory of Molecular and Translational Medicine, Key Laboratory of Birth Defects and Related Diseases of Women and Children of Ministry of Education at Sichuan University, Department of Obstetrics and Gynecology, West China Second University Hospital, Sichuan University, Chengdu, P.R. China.

\*These authors contributed equally to this work.

The online-only Data Supplement is available with this article at <http://hyper.ahajournals.org/lookup/suppl/doi:10.1161/HYPERTENSIONAHA.113.02688/-/DC1>.

Correspondence to Huaizhong Hu, Laboratory of Molecular and Translational Medicine, West China Second University Hospital, Sichuan University, 20 Ren Min Nan Lu, Chengdu, Sichuan 610041, P.R. China. E-mail [huaizhonghu@scu.edu.cn](mailto:huaizhonghu@scu.edu.cn)

© 2014 American Heart Association, Inc.

*Hypertension* is available at <http://hyper.ahajournals.org>

DOI: 10.1161/HYPERTENSIONAHA.113.02688