UV FLUORESCENCE-BASED DETERMINATION OF URINARY ADVANCED GLYCATION END PRODUCTS IN PATIENTS WITH CHRONIC KIDNEY DISEASE

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INTRODUCTION AND OBJECTIVE

Advanced glycation end products (AGEs) are a class of proteins or lipids that are non-enzymatically glycated and oxidized after contact with aldose sugars. The **accumulation** of AGEs results in **carbonyl stress**, which is characteristic for diabetes mellitus (DM), uremia, atherosclerosis and vascular dysfunction. In the present study, we evaluated the use of UV fluorescence as an **alternative tool** to detect urinary AGEs.

The aim of the study was to explore the possibilities of UV fluorescence spectrometry:
1. to **detect urinary AGEs** in well-characterized patient groups with chronic kidney disease (CKD) in comparison with healthy individuals
2. to investigate the **determining parameters** of the AGE-specific fluorescence signal

METHODS

STUDY COHORT	SAMPLING	METHODS
Controls Healthy individuals n=31 **CKD stage 2-4** • +DM +Proteinuria (P) n=46 • +DM -P n=27 • -DM +P n=45 • -DM -P n=46	Urine, n=195 Blood, n=195	**Urinary AGEs** - Using an excitation wavelength of 365 nm, the fluorescence spectra of urinary AGEs were recorded in the 400-620 nm emission range - Normalized spectra were adjusted for U_{creat} **Determining parameters** - Creatinine, albumin and total protein concentration - Hb, HbA1c, CRP, creatinine, total cholesterol, HDL-cholesterol and triglyceride concentration - Proteinuria, eGFR and LDL-cholesterol concentration - Medication

U_{creat}: urinary creatinine; Hb: hemoglobin; HbA1c: glycated hemoglobin; CRP: C-reactive protein; HDL: high-density lipoproteins; eGFR: estimated glomerular filtration rate; LDL: low-density lipoproteins

RESULTS

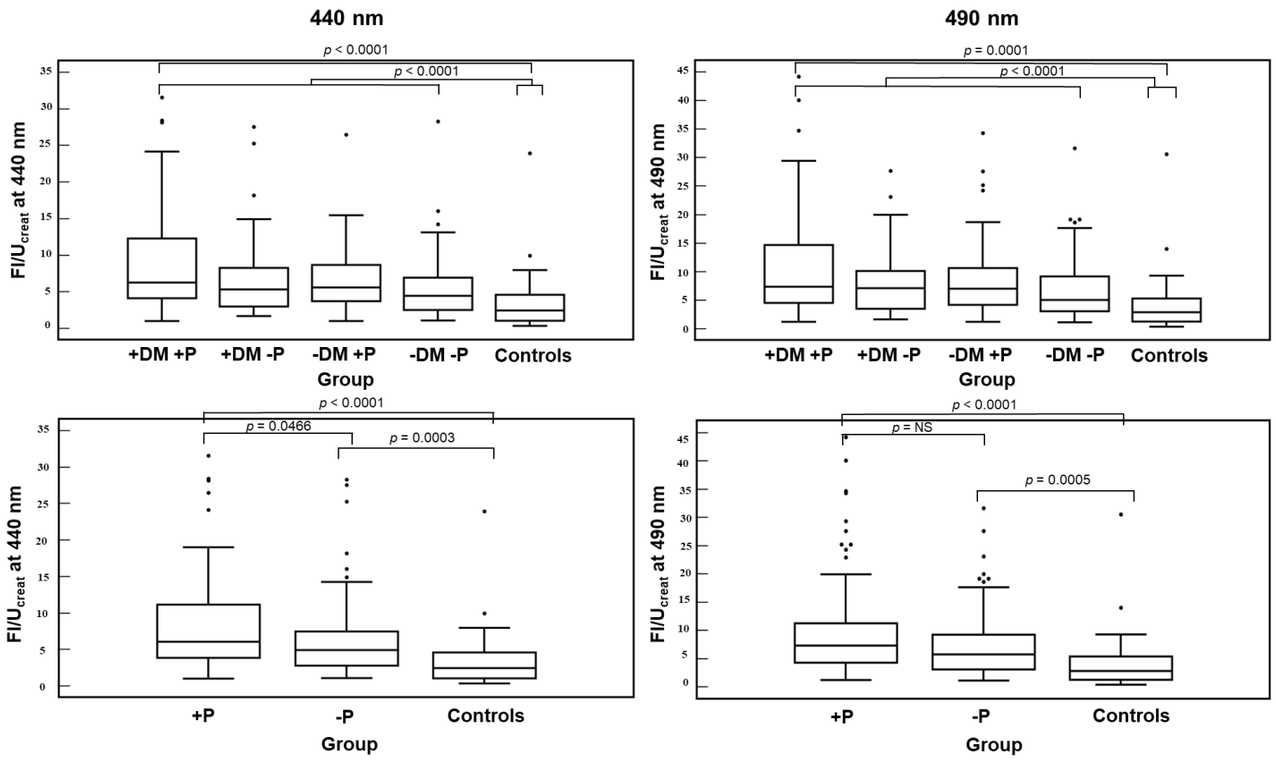

Figure 1. Creatinine adjusted fluorescence intensities (FI)

- AGE fluorescence intensity in **CKD patients > healthy controls** (440 nm: p < 0.0001; 490 nm: p = 0.0001)
- Fluorescence emission spectra in **CKD +P > CKD -P > healthy controls** (440 and 490 nm: p < 0.0001)

Table 1. Multiple regression model

Dependent Variable	Independent Variable	β (SE)	*p*-Value
Ln(Fluorescence intensity at emission wavelength **440 nm**) R^2 = 0.1970, p < 0.001	**Age (years)**	0.0107 (0.0046)	**0.0206**
	Ln(eGFR) (mL/min/1.73 m²)	-0.2565 (0.1429)	0.0743
	Ln(CRP) (mg/L)	0.1346 (0.0593)	**0.0245**
	Insulin treatment	0.2798 (0.0844)	**0.0011**
Ln(Fluorescence intensity at emission wavelength **490 nm**) R^2 = 0.1467, p < 0.001	**Age (years)**	0.0155 (0.0040)	**0.0001**
	Ln(CRP) (mg/L)	0.1166 (0.0632)	0.0667
	Insulin treatment	0.2664 (0.0880)	**0.0028**

R^2: coefficient of determination; β: standardized regression coefficient; SE: standard error

- Predictors
  - 440 nm: **age, CRP and insulin treatment**
  - 490 nm: **age and insulin**

CONCLUSION

The presented method is a **fast, simple, cheap, non-invasive method** to monitor the urinary AGE-load in the CKD population and this over a wide range of kidney function.

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MORE INFO
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