Evaluation of flavonoids and enterolactone in overnight urine as intake biomarkers of fruits, vegetables and beverages in the Inter99 cohort study using the method of triads.

Since collection of 24 h urine samples is very time consuming and difficult to obtain, epidemiological studies typically only obtain spot urine samples. The aim of the present study was to evaluate whether flavonoids and enterolactone in overnight urine could substitute flavonoids and enterolactone in 24 h urine as an alternative and more feasible biomarker of fruit, vegetable and beverage intake. A total of 191 individuals in the Inter99 cohort in Denmark completed the validation study. Concentrations of nine urinary flavonoid aglycones (quercetin, isorhamnetin, tamarixetin, kaempferol, hesperetin, naringenin, eriodictyol, phloretin and apigenin) and enterolactone were determined in overnight and 24 h urine samples, and their validity as biomarkers of fruit, vegetable and beverage intake was evaluated in relation to two independent reference methods (Inter99 FFQ data and plasma carotenoids) by using the method of triads. The intakes of fruit, juice, vegetables and tea reported in the FFQ were reflected by the flavonoid biomarker both in overnight and 24 h urine samples. Validity coefficients for the flavonoid biomarker in overnight urine ranged from 0.39 to 0.49, while the corresponding validity coefficients for the biomarker in 24 h urine ranged from 0.43 to 0.66. Although the validity coefficients were lower for overnight urine than for the 24 h urine flavonoid biomarker, they were still of acceptable magnitude. In conclusion, the results indicate that flavonoids and enterolactone in overnight urine samples may be used as a more feasible biomarker than 24 h urine for the assessment and validation of fruit, juice, vegetable and tea intakes in epidemiological studies. Copyright © The Authors 2012.