BACKGROUND AND AIMS: Breath analysis techniques allow detection and quantification of multiple analytes present in breath to the low parts per billion volume (ppbv) level. One such technique is selected ion flow tube–mass spectrometry (SIFT-MS), which can measure numerous volatile organic compounds (VOCs) in breath online and in real-time. This technique has already been used in an innovative manner to monitor infectious, inflammatory status and metabolic conditions. However, there is no evidence on its use in ambulatory patients with chronic kidney disease (CKD). End-stage renal disease patients are characterized by "uremic halitosis" caused by the accumulation of uremic toxins that are detectable in breath such as ammonia and amines. The aims of this study are identifying a possible correlation between the detected VOCs and the presence of CKD, moreover, exploring the range of VOCs levels in patients with different CKD stage.
METHOD: In the present study, a mobile Voice200Ultra® SIFT-MS instrument was made available by the Agilent SRA Division. The SIFT-MS allowed to quantify the VOCs in CKD patients. The SIFT-MS uses a precise and controlled application of “soft” chemical ionization. We enrolled 50 CKD patients, divided into two subgroups according to the estimated glomerular filtration rate (eGFR): eGFR ≥30 mL/min/1.73m² (A) and eGFR <30 mL/min/1.73m² (B) compared to 18 healthy subjects (C). The anamnestic data and information about any comorbidities such as arterial hypertension, cardiovascular and metabolic diseases, were collected for each patient. In order to reduce the possible interferences in the exhaled composition induced by different lifestyles, all participants were instructed to perform hygienic procedures before the test execution. The exhaled was sampled through the use of a standard spirometry mouthpiece for single use. 

RESULTS: Among all the VOCs analyzed, the most significant results are observed for ammonia and isoprene. In particular, the ROC curve of ammonia highlighted statistically significant differences between the three subgroups respectively A vs C AUC=0.756 p<0.001; B vs C AUC=0.942 p<0.001; A vs B AUC=0.797 p<0.001 (Figure 1). Youden index J between subgroups B and C defines the best cut-off =0.8704 associated with the criterion ammonia concentration ≤4700 ppbv with sensitivity =94.4% and specificity = 92.59%.

CONCLUSION: This preliminary data confirms the potential utility of SIFT-MS for the CKD diagnosis and the possible relation between the VOCs concentration and CKD stage. This exam could be a new, non-invasive, fast-performing diagnostic technique with real-time results useful for clinical management of CKD.

The study was inserted in the projects: “MioMen: nuova filiera dell’agro-industria e una cucina tracciata natura/benessere- Lazio Region” and “BioSynOL- Oil and Legumes: biodynamic and synergistic crops for naturally fortified foods and innovative products for health and sport – G.O.Tuscany Region”.

Abstracts Nephrology Dialysis Transplantation