

## BACKGROUND AND AIMS

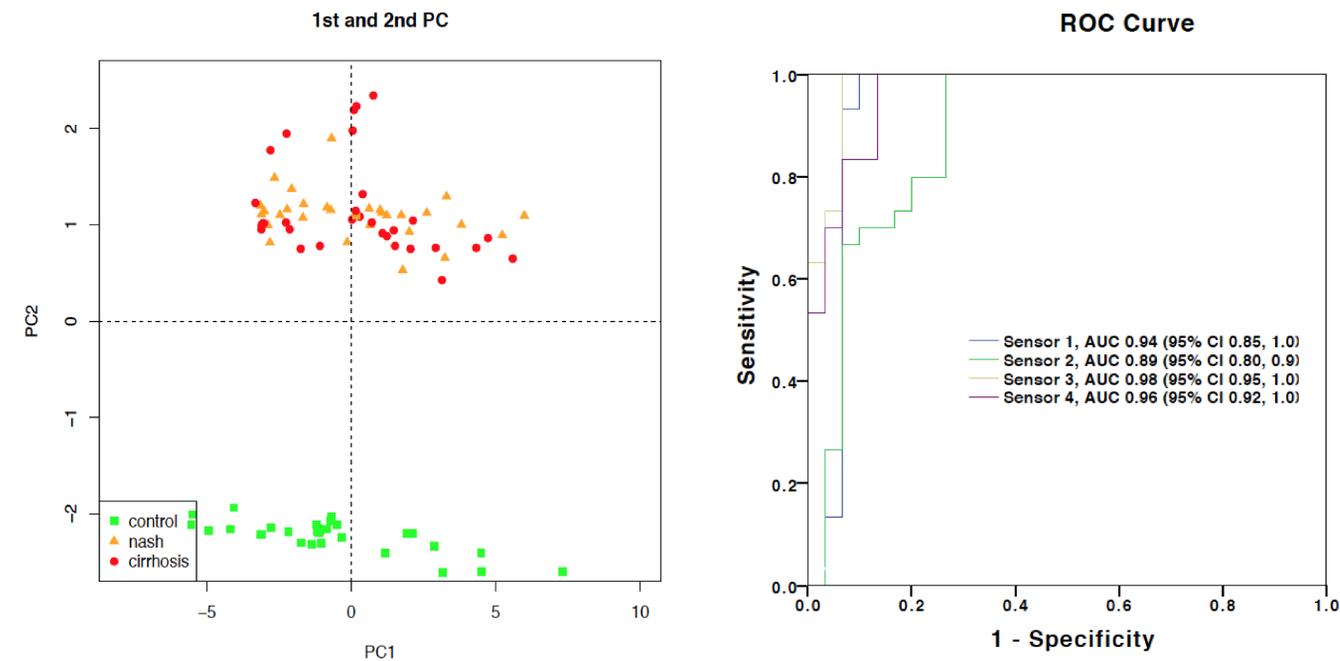
Human breath contains numerous volatile compounds which reflect metabolic activity. Electronic nose (eNose) react rapidly to these volatile metabolites and provide breath prints. Non-alcoholic fatty liver disease (NAFLD) is the hepatic manifestation of metabolic syndrome. We hypothesized breath prints obtained from eNose could distinguish healthy individuals from those with NAFLD.

## METHODS

The study was prospective single-center cohort study (ClinicalTrials.gov: NCT02950610) with training cohort and one-against all (leave-one out) cross validation verification (CVV). eNose (SpiroNose) is a custom-made device previously validated in respiratory and liver disease [1,2]. eNose was performed on well characterized NAFLD patients; a) Child's A cirrhosis(n=30), b) NAFLD non-cirrhosis (n=30) and c) self-declared healthy (n=30). Data were analyzed using R (v 2.3.2). Data reduction to 3 principal components (PCs) explained 97.8% of total variance. Data was further classified by k-nearest neighbor's (k-NN) algorithm, a non-parametric machine learning algorithm for classification.

## RESULTS

In patients with NAFLD cirrhosis, eNose was able to accurately classify with 100% sensitivity ( $p < 0.001$ , cross-validation verification [CVV] 96%) from healthy subjects, independent of age and gender



Sensor 1, Sensor 2, Sensor 3 and Sensor 4 identified NAFLD cirrhosis patients with AUC 0.96 (standard error=0.043;  $p < 0.001$ ), 0.89 (standard error=0.046;  $p < 0.001$ ), 0.98 (standard error =0.016;  $p < 0.001$ ) and 0.96 (standard error=0.022;  $p < 0.001$ ) respectively

eNose was able to differentiate between healthy from; non-cirrhotic NAFLD ( $p < 0.001$ , CVV 96.8%) and NAFLD cirrhotic ( $p < 0.001$ , CVV 95.1%).

This method, designed to reflect the generalization property of the  $k$ -nearest neighbour's (k-NN) classifier, scored a classification rate of 96%.

## CONCLUSIONS

Our study demonstrates the ability of eNose to accurately distinguish NAFLD from healthy individuals.

Thus, eNose technology can provide rapid, non-invasive point-of-care screening to risk stratify patients, which can reduce the burden of liver biopsy.



## REFERENCES

- de Vries R, et al. Integration of electronic nose technology with spirometry: validation of a new approach for exhaled breath analysis. J Breath Res 2015;9:046001.
- McDonald N Sinha R, et.al. Exhaled Breath Profiling by Electronic Nose as a Novel Non-Invasive Method for Assessment of Chronic Liver Disease: Proof of Principle Study. Journal of Hepatology 2016;64:S734–S5.

## CONTACT INFORMATION

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