ANALYSIS OF ELECTRONIC NOSE DATA FOR THE DISCRIMINATION OF VOLATILES FROM FOOD-SALIVA INTERACTION IN INDIVIDUALS WITH DIFFERENT BMI

Nicola Caporaso[1,2], Andrea Balivo[1], Raffaele Sacchi[1], Alessandro Genovese[1]

1. University of Naples "Federico II", Department of Agriculture, Portici (NA), 80055, Italy
2. Department of Research & Development, Buhler Sortex, London, E16 2BF, UK
nicola.caporaso3@unina.it; alessandro.genovese@unina.it (corresponding authors)

The lipid fraction of foods has a dramatic influence on their nutritional profile as well as their sensory impact. During the eating process, volatile compounds originate from the interaction between saliva and the food matrix, due to mechanical action and enzymatic reactions.

It is known that the activity of lipase and α-amylase is higher in subjects with larger body mass index (BMI). Recent research showed that the release of certain volatiles is linked to the variation of salivary composition, that is different in normal weight and obese subjects [1,2].

The electronic nose (EN) is an instrument using electronic chemical sensors that detect specific group of volatile molecules. An EN often contains multiple sensors, such that several groups of molecules are recorded.

This contribution will present an experiment aimed to verify the ability of EN in detecting differences in volatiles emitted after the interaction of a food product with human saliva produced by subjects with different BMIs.

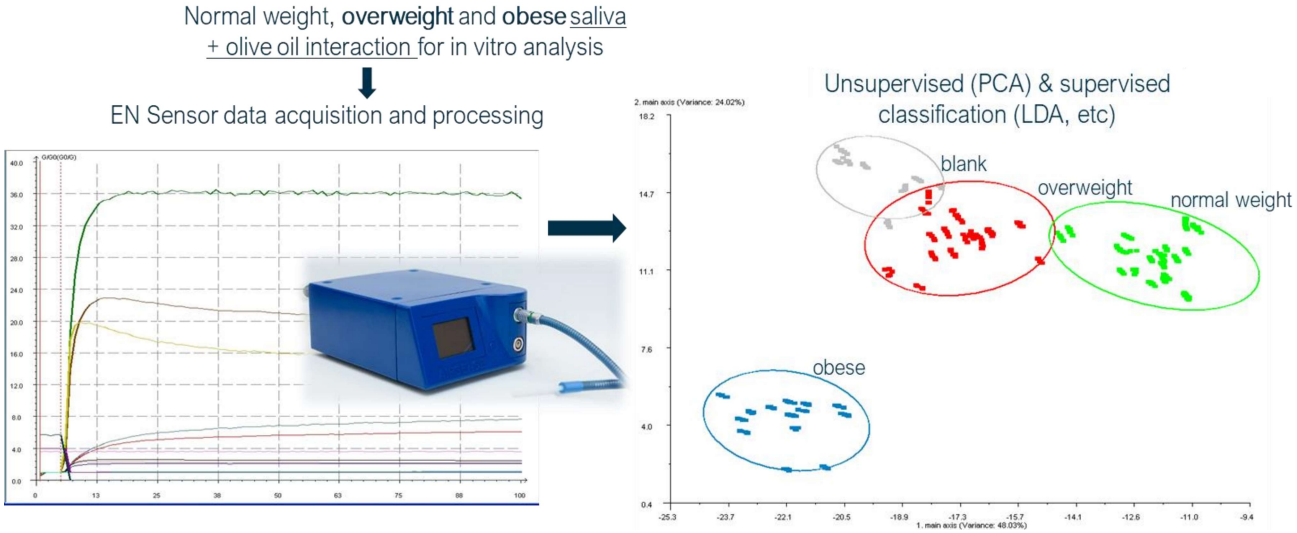
Extra virgin olive oil (EVOO) was used as our fat of preference, which was combined with saliva from 60 subjects (age range: 18-65 years), of which 23 had normal BMI, 18 was overweight and 14 was obese (water was used as the blank for the analysis). After 4 minutes of interaction between 0.3 mL of saliva and 100 mL EVOO, the released volatiles were recorded up to 100 seconds using an Electronic Nose PEN2 (Airsense Analytics, Germany) fitted with 10 sensors MOS (Metal Oxide Semiconductor).

The data analysis aimed to firstly highlight the part of the signal, then on the 'cleaned' data, several normalization methods were applied in order to remove unwanted effects and to standardize the responses of different runs, then PCA was applied as an

unsupervised exploratory tool to understand the data structure, and finally some other chemometric methods were applied to generate a classification model, which was cross-validate by using a leave-one-out cross-validation by excluding one subject at a time.

Despite the inter- and intra-variability of the subjects' salivary composition and the analytical error of the EN, it was possible to find data cluster by using PCA according to the subjects BMI, and differentiating the obese individuals from the others (Figure 1). A classification model based on linear discriminant analysis (LDA) was also successfully employed, showing a correct classification rate (cross-validation) of 88.6%, 92.6 and 93.9% for overweight, obese and normal-weight subjects, respectively. A partial least square discriminant analysis (PLS-DA) was also built, showing potential to classify subjects based on 3 groups of data, with promising applications for screening of fat-saliva matrices simulating food consumption (Figure 1). This research could be useful to understand the different response of subjects to new food products, by using an objective instrumental tool which can provide fast responses, in addition to proper data treatment and chemometric analysis.

Figure 1. Schematic representation of the experiment and the results from EN analysis.



References

[1] Piombino P, Genovese A, Esposito S, Moio L, Cutolo PP, Chambery A, Ercolini D (**2014**). Saliva from obese individuals suppresses the release of aroma compounds from wine. PloS one, **9**(1), e85611.

[2] Genovese A, Rispoli T, Sacchi R (**2018**). Extra virgin olive oil aroma release after interaction with human saliva from individuals with different body mass index. *Journal of the Science of Food and Agriculture*, **98**(9), 3376-3383.