Pet food manufacturers apply flavors to pet food in order to increase the palatability of their products. These dry and liquid flavors consist of taste and aroma molecules designed to appeal to the pet. Typically, the two bowl test is the traditional way of assessing the palatability of pet food products. However, there have been recent and growing interests in the development of rapid and sensitive instrumental techniques with potential application in correlation to sensory results. Therefore, since flavor perception involves both senses of smell and taste in addition to other sensory cues, it is important to evaluate systems that provide information about the overall smell and taste of pet foods. Electronic instruments are utilized for this purpose.

These instruments are used to obtain sample composition measurements in liquid and gas media. They do not provide information about specific components present in the sample, but provide and group all the information together in patterns and trends, in line with what the animal experiences from the entire diet. This is because the smell or taste of a product is derived from a combination of a large number of compounds. Since around 1994 when these instruments became popular\(^1\), they have been used for analyzing, classifying, and comparing complex food matrices\(^2\). They have been used to complement traditional sensory test techniques in the areas of product development, product consistency evaluations, as well as problem solving. Previous applications include food industry, medical applications, environmental, as well as pharmaceutical industry\(^3,4\).

There are various types of electronic instruments in the market, two of which are the electronic nose and electronic tongue. The electronic nose instrument provides information about the overall aroma profile of a sample presented to it. Measurement in gas medium of sample composition relate to the overall aroma profile, while liquid medium measurements using the electronic tongue provide information about the overall taste profile of the sample.
For odor analysis, GCMS is an important tool. However, the process of identifying all the separate and specific sample components could be very time consuming. Using the electronic nose technology is faster and provides useful information to complement further sensory tests. These electronic noses are used to analyze the volatile compounds available in the headspace of samples, to obtain the aroma fingerprint. There are two types of electronic noses, namely the sensor array and mass spectrometric (MS)–based instruments. The sensor array-based instruments employ an array of electronic chemical sensors with specific or global selectivity of various molecules for aroma measurements. The specific sensor technology adopted by any system is very important for the practical use of the instrument. One of the most common chemical-based sensor instruments use metal oxide semiconductor sensors because of their stability and good reproducibility. The MS-based instruments detect compounds according to their mass to charge ratio profile, as done using the GCMS. These MS-based instruments provide fingerprint model of the sample and as such, they are called Fingerprint Mass Spectrometers (FMS). Output data from the instruments are subjected to chemometrics for pattern recognition. Chemometrics is the process of performing analysis on chemical data. Complex and large chemical data are subjected to various methods such as multivariate statistics, in order to develop models and/or equations which help to further classify and understand inherent trends, patterns, and other relationships in the data. These models are also used for predictive purposes. Some of the common chemometric methods include Principal Component Analysis (PCA), Partial Least Squares (PLS), and Statistical Quality Control (SQC).

For taste analysis, the e-tongue technology is primarily based on electrochemical sensor technology. These sensors are coated with specific membranes which respond to the different taste attributes present in a liquid sample medium. Measurement is commonly based on determining the voltage difference between a sensor and a reference electrode as the membrane material interacts with the ionic components of the sample in solution. As applicable for the electronic nose instruments, output data from the instruments are subjected to chemometrics for pattern recognition help to further classify and understand inherent trends, patterns, and other relationships in the data. These models are also used for predictive purposes. Some of the common chemometric methods include Principal Component Analysis (PCA), Partial Least Squares (PLS), and Statistical Quality Control (SQC).
COMBINED TECHNOLOGY – ENT

Once the final outputs are obtained from the separate electronic nose and electronic tongue instruments, it is also advantageous to join both outputs to obtain the combined electronic nose and tongue output. The ENT output essentially combines both the “smell” and “taste” of the product, much like the animal experiences during consumption of the meal. It should be noted that this information will need to be considered with other product attributes, such as the pet food texture, in order to obtain the overall experience delivered to the animal by the food sample. The combination of both technologies—electronic nose and tongue (ENT)—provides additional dimensions of information related to the products being analyzed. For example, when the combined technology was used to process different types of fruit juices, the classification properties of the samples using PCA were improved.

AFB began using ENT in 2007. AFB uses the technology for both new palatant development and to help ensure consistent flavor and pet food performance. AFB has shared findings and best practices upon request with pet food companies, and at professional events like the Petfood Forum and the International Symposium on Olfaction and Electronic Nose Proceeding. For more information about the use of electronic nose and tongue in pet food, contact your account manager or an AFB International office listed below.

REFERENCES

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