Pet food manufacturers apply flavors to pet food to increase the palatability of their products. These dry and liquid flavors consist of taste and aroma molecules designed to appeal to the pet. The two-bowl test is the traditional way of assessing the palatability of pet food products. However, interest is growing in developing rapid and sensitive instrumental techniques with the potential to correlate sensory results, especially for the senses of taste and smell. Electronic instruments can be helpful for this purpose.

These electronic instruments may be used to identify specific components present inside the headspace—the immediate area around the food sample—or they may analyze information from a number of sources to identify patterns and trends that help researchers better understand what an animal experiences when approaching and consuming a food sample.

Since rising to popularity around 1994, researchers have used these instruments to analyze, classify and compare complex food matrices. They have complemented traditional sensory test techniques used in product development and consistency evaluation, as well as in problem solving. Previous applications include the food and pharmaceutical industries, as well as medical and environmental applications.

Among the electronic instruments on the market are the electronic nose and electronic tongue. The electronic nose instrument provides information about the overall aroma profile of a sample using measurements in a gas medium, while the electronic tongue provides information about the overall taste profile of a sample using liquid medium measurements.

For odor analysis, gas chromatography-mass spectrometry (GCMS) is still an important tool appropriate for identifying and quantifying specific chemical compounds. However, it can be very time consuming. Electronic nose technology is faster and can be supplemented with further sensory tests. There are several different electronic nose instruments with varying capabilities.

**ELECTRONIC NOSE INSTRUMENTS INCLUDE:**

- **The sensor array.** This instrument type employs electronic chemical sensors capable of selecting various molecules for aroma measurements. The specific sensor technology used in any system helps determine the practical use of the instrument. One of the most common chemical-based sensor instruments uses metal oxide semiconductor sensors because of their stability and good reproducibility.

- **Mass spectrometric (MS)-based instruments.** Like GCMS, MS-based instruments detect compounds according to their mass-to-charge ratio profile. They provide a “fingerprint” model of the sample, earning them the name Fingerprint Mass Spectrometers (FMS).

- **Ultra-fast gas chromatographic (GC)-based instruments.** These instruments detect specific volatile flavor compounds through polar and non-polar columns, identifying their peak intensity and an odor descriptor.

Output from these electronic nose instruments are subjected to chemometrics—a process of performing analysis on complex chemical data. The results of this process allow researchers to 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 final outputs are obtained from the separate electronic nose and electronic tongue instruments, they can be combined in a process known as ENT to provide additional dimensions that help approximate the overall “smell” and “taste” of the product, much like the animal experiences while eating. This information will need to be considered with other product attributes, such as pet food texture, to better understand the animal’s overall experience of the food sample.

AFB began using ENT in 2007 and today uses the technology for a number of purposes, including to:

► Develop pet food palatants
► Evaluate product consistency and performance
► Measure product stability and shelf life
► Analyze off-odors for customers
► Provide flavor and aroma profile analyses to understand the difference between products

AFB shares findings and best practices upon request with pet food companies and at professional events like Petfood Forum, the International Symposium on Olfaction and Electronic Nose and the American Chemical Society National Meeting. 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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To discover all the ways AFB International can help you improve product palatability and market share, visit our website at afbinternational.com or contact us directly:

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