Title Electronic nose and electronic tongue in food production and processing

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Abstract

Purpose of review: The characterisation of food flavour is of great interest to the food industry and to many researchers. Fast, non-destructive means of food flavour detection are now feasible using electronic nose (e-nose) and electronic tongue (e-tongue) systems. This manuscript reviews the recent development of e-nose and e-tongue and their applications in food flavour detection.

Main findings: Emerging in the 1980s, e-nose and e-tongue technology were applied in environment monitoring, pharmacy, the automotive industry and medical diagnosis. Studies have also explored the potential of e-nose and e-tongue techniques in food classification, freshness evaluation, authenticity assessment and quality control. This potential is enhanced by the development of new pattern recognition methods that not only support the improvement of data processing, analysis and interpretation, but also enable quantification of food flavour attributes for automation of food processes.

Limitations/implications: E-nose and e-tongue are promising techniques in food flavour detection, but due to their inferior sensitivity and stability, they are not ready to fully replace analytical methodologies such as gas chromatography-mass spectrometry which provides precise results of constitutes. Recognition of these limits should be advised in applications of e-nose and e-tongue.

Directions for future research: Future development of e-nose and e-tongue will focus on new sensing techniques, data processing and analysis methods to improve their accuracy, sensitivity and stability, miniaturisation of devices for practical uses, and the development of specific systems for specific food varieties. In contrast to visual and auditory sensations which can be recorded, transmitted and retrieved with existing instruments, “smell” and “taste” still cannot be adequately expressed, defined or explained. E-nose and e-tongue techniques can be used as tools to study the human flavour-evaluation process.