

## **Deteksi Cemarkan *Listeria monocytogenes* pada Susu Ultra High Temperature (UHT) Menggunakan *Electronic Tongue***

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### **INTISARI**

*Listeria monocytogenes* merupakan salah satu bakteri penyebab *foodborne disease* (penyakit tular makanan). Bakteri ini dapat ditemukan pada makanan seperti susu yang dapat mempengaruhi kesehatan masyarakat. Saat ini metode pengujian cemarkan masih membutuhkan waktu yang panjang, keahlian khusus dan alat yang mahal. *Electronic tongue* adalah alat yang mampu mengenali rasa dan telah digunakan pada pemeriksaan dan klasifikasi susu. Penggunaan *e-tongue* sebagai alternatif yang cepat, mudah dan murah diperlukan untuk mendeteksi patogen dalam makanan serta dapat diaplikasikan di lapangan. Penelitian ini bertujuan untuk mendeteksi cemarkan bakteri *L. monocytogenes* pada susu menggunakan *e-tongue* yang dikembangkan Laboratorium Fismatel, Fakultas MIPA UGM. Pelaksanaan penelitian ini menggunakan biakan murni *L. monocytogenes* serotipe 4b ATCC 13932. Tahap awal dilakukan *re-identifikasi* bakteri *L. monocytogenes* dengan pewarnaan Gram dan uji biokimia. Pengujian *electronic tongue* menggunakan sampel susu *ultra high temperature* (UHT) ukuran 125ml. Sampel dibagi menjadi 8 kelompok yaitu kelompok 1/ kontrol untuk susu UHT tanpa inokulasi dan kelompok 2 hingga 8 diinokulasi bakteri 1 ml menurut standart 0,5 larutan McFarland yang setara dengan  $10^3$  CFU/ml dan diamati sesuai masa inkubasi 2,8,16,24,32,40 dan 48jam. Pengujian *electronic tongue* dianalisis menggunakan metode *Principal Component Analysis* (PCA) dan *Linear Discriminant Analysis* (LDA). Hasil penelitian ini menunjukkan bahwa *electronic tongue* dengan metode PCA mampu mengklasifikasikan data sebesar 92,18%, dan LDA mampu memisahkan data sebesar 91,50%, nilai akurasi diperoleh sebesar 98,8%, sensitivitas 98,8% dan spesifisitas sebesar 98,9%. *Electronic tongue* yang dianalisa menggunakan metode LDA mampu mendeteksi susu yang terkontaminasi *L. monocytogenes*.

Kata kunci: *Electronic tongue*, *foodborne disease*, *Listeria monocytogenes*, susu

## **Detection of *Listeria monocytogenes* Contamination in Ultra High Temperature Milk (UHT) Using Electronic Tongue**

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### **ABSTRACT**

*Listeria monocytogenes* is one of the bacteria causing foodborne diseases. These bacteria can be found in foods such as milk, which can affect people's health. Currently, the contamination testing method still requires a long time, specific expertise, and expensive tools. The electronic tongue is a tool that is able to recognize taste, which has been used in the examination and classification of milk. The use of e-tongue as a fast, easy, and inexpensive alternative is needed to detect pathogens in food and can be applied in the field. This study aimed to detect bacterial contamination of *L. monocytogenes* in milk using the e-tongue developed by the Laboratory of Fismatel, Faculty of Mathematics and Natural Sciences UGM. This research was carried out using a pure culture of *L. monocytogenes* serotype 4b ATCC 13932. The initial stage was re-identification of *L. monocytogenes* bacteria by Gram staining and biochemical tests. The electronic tongue test used 125ml ultra-high temperature (UHT) milk samples, categorized into eight groups. The first group was UHT milk without inoculation as a control. Meanwhile, the second until the eighth group was UHT milk inoculated with 1 ml bacteria according to the 0.5 McFarland solution standard equivalent to 103 CFU/ml and observed according to the incubation period of 2, 8, 16, 24, 32, 40, and 48 hours. The electronic tongue test was analyzed using Principal Component Analysis (PCA) and Linear Discriminator Analysis (LDA) methods. The results of this study indicate that the electronic tongue with the PCA and LDA method can classify and separate data by 92.18% and 91.50%, consecutively. The accuracy, sensitivity, and specificity value obtained was 98.8%, 98.8%, and 98.9. %, respectively. Electronic tongue analysis using the LDA method was able to detect milk contaminated with *L. monocytogenes*.

**Keywords:** Electronic tongue, foodborne disease, *Listeria monocytogenes*, milk