Pengembangan Deteksi Infeksi *Trypanosoma evansi* dengan Menggunakan Metode Kombinasi *Electronic Tongue* dan *Machine Learning*

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INTISARI

Trypanosoma evansi (*T. evansi*) merupakan protozoa penyebab penyakit Surra, penyakit menular strategis pada berbagai ternak. Diagnosis Surra masih menjadi permasalahan umum di lapangan karena berdasarkan pada anamnesis, pengamatan manisfestasi klinis, dan ulas darah dengan pewarnaan Giemsa, namun metode tersebut memiliki sensitivitas yang rendah sehingga perlu dikembangkan metode yang lebih cepat, sensitif, dan dapat diaplikasikan di lapangan. Penelitian ini bertujuan untuk mengembangkan deteksi infeksi *T. evansi* dengan menggunakan kombinasi metode *electronic tongue* (*e. tongue*) yang terdiri dari 28 larik sensor dan *machine learning*. Desain penelitian yaitu *true experiment posttest only control group design*. Penelitian menggunakan tiga puluh ekor tikus yang dibagi menjadi lima kelompok. Kelompok kontrol (K_1) diinjeksi 0,3 ml NaCl fisiologis dan kelompok perlakuan (K_2, K_3, K_4 dan K_5) masing-masing diinjeksi 10^4 *T. evansi* dalam 0,3 ml PBS-G. Kelompok K_1 diambil darah melalui *intracardiac* dan vena lateralis ekor pada hari ke-7, sedangkan kelompok K_2, K_3, K_4 dan K_5 dilakukan pada tingkat parasitemia K_2 (+1), K_3 (+2), K_4 (+3), dan K_5 (+4). Pemeriksaan adanya infeksi parasit dilakukan berdasarkan *Wet Blood Film* (WBF), ulas darah, *Haematocrit Centrifugation Technique* (HCT), *Polymerase Chain Reaction* (PCR) dan kombinasi *e-tongue* dengan *machine learning*. Hasil pemeriksaan WBF, ulas darah, HCT dan PCR menunjukan bahwa kelompok K_1 (negatif), K_2, K_3, K_4, dan K_5 positif *T. evansi*. Hasil pengujian *e-tongue* dan *machine learning* sampel darah menghasilkan total variansi *Principal Component Analysis* (PCA) 75,80% dan *Linear Discriminant Analysis* (LDA) 97,96%, sedangkan sampel serum PCA 40,52% dan LDA 97,46%. Hasil analisis *Support Vector Regression* (SVR) menunjukan akurasi yang baik dengan R^2 0,9978. Kombinasi *e-tongue* dan *machine learning* dapat mendeteksi sampel negatif dan positif *T. evansi*.

Kata kunci: *Trypanosoma evansi*, *electronic tongue*, *machine learning*, PCA, LDA dan SVR

Development of *Trypanosoma evansi* Infection Detection Using the Combination of Electronic Tongue *and* Machine Learning Method

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ABSTRACT

Trypanosoma evansi (*T. evansi*) is a protozoan causing Surra disease, a strategic infectious disease in various livestock. The diagnosis of Surra still becomes a common issue in field as it is based on anamnesis, clinical manifestation observation, and blood smear with Giemsa staining. However, this method has low sensitivity; hence, it is deemed necessary to develop a method that is faster, sensitive, and applicable in field. This study aimed to develop the detection of T. evansi infection by using a combination of the electronic tongue (e. tongue) consisting of 28 sensor arrays and machine learning. The research had a true experiment posttest only control group design. The study used thirty rats divided into five groups. The control group (K1) was injected with 0.3 ml of physiological NaCl and the treatment group (K2, K3, K4, and K5) were injected with 104 *T. evansi* in 0.3 ml of PBS-G. The blood of the K1 group was taken through the intracardiac and tail lateral veins on day 7, while the K2, K3, K4, and K5 groups were performed at the parasitemia level of K2 (+1), K3 (+2), K4 (+3), and K5 (+4). Examination for parasitic infection was carried out based on Wet Blood Film (WBF), blood smear, Haematocrit Centrifugation Technique (HCT), Polymerase Chain Reaction (PCR), and a combination of e-tongue and machine learning. The results of the WBF examination, blood smear, HCT, and PCR showed that group K1 was negative, in contrast to K2, K3, K4, and K5, for T. evansi. The results of the test for e-tongue and machine learning blood samples resulted in a total variance of Principal Component Analysis (PCA) of 75.80% and Linear Discriminant Analysis (LDA) of 97.96%, while serum samples of PCA were 40.52% and LDA 97.46%. The results of the Support Vector Regression (SVR) analysis showed good accuracy with R2 of 0.9978. The combination of e-tongue and machine learning could detect negative and positive samples of *T. evansi.*

Keywords: Trypanosoma evansi, electronic tongue, machine learning, PCA, LDA, and SVR