A portable impedance biosensor instrument for rapid detection of avian influenza virus

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Abstract: The objectives of this study were to improve our previous portable impedance biosensor instrument with more rapid, reliable and quantitative features for detection of avian influenza (AI) virus and to evaluate its performance using H5N1 and H5N2 virus. A high-intensity and high-gradient magnetic field based separator was designed and fabricated for rapid separation of AI virus. KPL measuring solution was used as background medium to obtain higher stability. Twin BNC connection between the electronic circuit and the biochip was employed to prevent radio frequency interference. The amplitude limiting average filtering method was used to eliminate false signals and a linear regression model was built for the embedded control software. A data acquisition software was developed for communication and data processing. This impedance biosensor instrument could work stand-alone or be connected with a laptop via USB interface. The experimental results showed that the impedance biosensor could identify H5N1 virus with a detection limit of 103 EID50/mL in 30 min. A prototype of the improved impedance biosensor was fabricated for evaluation with cloacal swab samples from AI H5N2 virus infected chickens. Compared with viral isolation, this biosensor instrument had a false negative rate of 10%, whereas realtime RT-PCR showed a false negative/positive rate of 20%. ©2010 IEEE.

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