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Computational Approaches Toward Prevention and Surveillance of Lassa Fever in Developing Countries

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Biotechnological Approaches to Sustainable Development Goals

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Abstract

Lassa fever (LF) is a viral hemorrhagic disease caused by the Lassa virus harbored in multi-mammate rat, *Mastomys natalensis*, usually abundant in the tropical zone of West Africa. High fatality rate recorded from the previous LF outbreaks further confirms the public health risk and potential future outbreaks. More than 80% of Lassa virus (LASV) infections are either asymptomatic or mild with usual clinical signs of febrile pyrexia and hemorrhagic sclera associated with nervous morbidity, respiratory distress, and encephalitis. Early detection and diagnosis with ELISA and PCR provide effective treatment and clinical management with the use of ribavirin (first-line antiviral drug). Prevention of LF outbreaks is the central goal toward achieving sustainable public health. The computational approach is an innovative strategy for the prevention and surveillance of LF with the application of bioinformatics, information technology, and molecular pipelines for adequate prevention and control. Toward effective prevention, the application of in silico methods is essential for early detection, diagnosis, sequencing for characterization of new and existing variants, drug design, and required vaccine candidate detection and development. Besides acquiring treatments and other preventive methods, surveillance is critical to monitoring the disease emergence and curtailing its spread. Geographic information system (GIS) provides ideal platforms for the surveillance and monitoring of Lassa virus. Also, computational statistical models that include Bayesian and forest models are used to predict the spread of the disease. The computational approach provides significant potential for the prevention and surveillance of LF, but its application is relatively low due to high cost and lack of expertise, particularly in low-income settings. There is a need for training more personnel to further prevent the outbreak and fatality of LF.

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