Routine and pulse vaccination for Lassa virus could reduce high levels of endemic disease: a mathematical modelling study

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Background: Lassa fever is an acute viral haemorrhagic illness caused by Lassa virus (LASV), a rodent-borne pathogen posing major public health risks[1]. LASV is endemic to much of Sub-Saharan West Africa[2], where seasonal outbreaks cause significant morbidity and mortality[3]. In addition to the impact of endemic Lassa fever in West Africa, the World Health Organisation has identified LASV as a virus with potential to cause widespread epidemics[4]. Increased global awareness of LASV has led to development of improved diagnostic tests, treatments and vaccines[5]. As vaccine candidates are trialled, it is essential to assess the potential outcomes of introducing a LASV vaccination program in endemic regions.

Methodology/Principal Findings: This study investigates the potential outcomes of routine and pulse vaccination strategies using a deterministic mathematical model that captures seasonal LASV transmission between rodents and humans. For plausible parameter values, we find that immunisation of 40% of infants achieves a population-level reduction in infectious case numbers of 43%. Population-wide pulse immunisation at 40% coverage every 20 years maintains a reduction at or above this level and is more rapidly effective. Similar vaccine doses delivered at reduced frequency but increased coverage achieve a greater reduction in infectious cases.

Conclusions/Significance: An effective LASV vaccination program would incorporate pulse vaccination in addition to routine childhood immunisation to limit disease. Estimates of feasible vaccine coverage and effectiveness are needed to fully quantify the likely benefits of a vaccination program in LASV endemic regions.

References:

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