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Modeling the potential distribution of Wesselsbron, Sindbis, and Middelburg viruses and their vectors in Africa under future climatic and land-use changes

Inhalt

Outbreaks of zoonotic arboviruses originating in Africa have emerged amidst complex ecological changes. Despite sporadic epizootics and human cases of *Wesselsbron virus* (WSLV), *Sindbis virus* (SINV), and *Middelburg virus* (MIV) in Africa, knowledge of associated risks remains insufficient for prevention. Using the Maximum entropy approach, we developed species distribution models that predict the ecological drivers and niches of arboviral diseases in Africa. We used the ecological niches of *Aedes circumluteolus* and *Aedes mcintoshi* for WSLV; *Culex univittatus* and *Culex pipiens* for SINV; and *Mansonia africana* and *Aedes mcintoshi* for MIV. Mosquito species occurrence data were combined with climate and land-use data for current (2015) and future (2021 –2040) scenarios under two shared socioeconomic pathways of emission and climate projections. Our analyses show that changing patterns in precipitation, especially precipitation in dry and warm seasons, urbanization, human population, livestock density, and climate change exacerbate mosquito expansion and risk for arboviral diseases into new geographic areas. The models predicted hotspots for WSLV, SIV, and MIV in Southern and Eastern Africa and future expansions to the Sahara Desert. Our study highlights the role of climate change in shaping arboviral disease transmission and provides spatial maps to aid targeted surveillance and early outbreak detection.

Keywords

climate, land-use, emerging, arbovirus, mosquito, Africa

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