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Risk of sleeping sickness in Africa spreads under climate change

By 2090, up to 76.7 million more people in Africa could be at risk of infection by the parasite that causes sleeping sickness, according to recent research. The study predicted which areas of Africa would be at greatest risk in future.

Climate change over the next century is expected to significantly affect how pathogens interact with humans and animals. Sleeping sickness, or African trypanosomiasis, has been identified as an infectious disease that is very likely to be affected by climate change. It is caused by a parasite carried by Tsetse flies which infects the nervous system and, if untreated, is fatal. There are around 70,000 cases of sleeping sickness every year, and an estimated 60 million people in sub-Saharan Africa are at risk of infection.

To predict the spread of the illness as the climate changes, the researchers developed a model of parasite transmission between human and animal hosts and the Tsetse flies which carry it, which was sensitive to temperature changes. The researchers considered disease transmission under two climate change scenarios, the moderate B1 scenario and the more extreme A2 scenario, from the IPCC's Fourth Assessment Report[1].

Their model suggested that parts of the parasite's current range may become too hot for its survival. However, rising temperatures in other areas will bring new regions into the parasite's preferred temperature range. These new areas are home to large human and animal populations which have never been exposed to sleeping sickness before.

Historically, sleeping sickness outbreaks have occurred at 14 distinct locations in southern and eastern Africa, all of which lie within the current suitable temperature range predicted by the model. However, by 2090, three of these historic locations will lie in areas that are too hot for the parasite under the B1 scenario. For the A2 scenario, 10 of the locations will be too hot.

The model suggested that, under the A2 scenario, the total predicted range will have shrunk to just 85.2% of the current range size by 2090 as many areas become too hot. However, 63% of this new range will cover areas that were previously too cold, including densely-populated East African highlands. As a result, the future range could expose around 76.7 million new people to the disease.

Similarly, 35% of the parasite's range under the moderate B1 scenario will cover new territory, potentially affecting an additional 46.4 million people. By the end of the century, the parasite's range under the B1 scenario could be 111.8% larger than it is at present.

The researchers caution, however, that their predicted ranges are based solely on temperature and provide a maximum possible spread of the parasite, rather than an accurate map of future distributions. For instance, the spread of the sleeping sickness parasite depends on the presence of the Tsetse fly, which is itself influenced by temperature, relative humidity, vegetation, and the presence of hosts. The parasite also needs a 'reservoir' animal host, and climate and land use changes are likely to alter wildlife and livestock distributions, so further changing the parasite's distribution.

However, despite the limitations, the methods do highlight areas that could be at risk if temperatures continue to rise, and the researchers say they are useful tools for the preliminary assessment of new disease risks caused by climate change.

1. For a summary of the IPCC's emissions scenarios see: www.ipcc.ch/publications_and_data/ar4/wg3/en/spmsspm-b.html

Source: Moore, S., Shrestha, S., Tomlinson, K.W., & Vuong, H. (2011). Predicting the effect of climate change on African trypanosomiasis: integrating epidemiology with parasite vector biology. *Journal of the Royal Society Interface*. Doi: 10.1098/rsif.2011.0645.

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