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Short Note

The Asian Tiger Mosquito Presents a Looming Threat to Australian Public Health

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The Asian tiger mosquito, *Aedes albopictus*, can carry several flaviviruses such as dengue, yellow fever and Zika, as well as the alphavirus chikungunya, all of which are now recognised as causative agents of major human infectious diseases [1]. The infectious bite of a mosquito has the capacity to transmit any of these closely related positive-sense, single-stranded RNA arboviruses to a person. While infection is often asymptomatic it may cause a short-lived febrile illness, typically characterised by influenza-like symptoms with headache, muscle ache and joint pain, but sometimes leading to debilitating chronic fatigue and more significant, sometimes fatal, disease-specific clinical manifestations [2].

Ae. albopictus is secondary to the yellow fever mosquito *Ae. aegypti* as a vector of dengue in settings of endemicity, but it plays an important role in areas of dengue emergence [3]. Thus, *Ae. albopictus* can clearly transmit important arboviral infections of humans at scales that are important to public health. Native to South East Asia, *Ae. albopictus* is considered to be one of the worst invasive vector species worldwide. In the northern hemisphere, in both Europe and North America this mosquito is currently restricted to southern parts, but on account of ongoing variations in habitat suitability, notably temperature and precipitation increases, it is expected to expand its potential range further northwards [4,5].

There is a parallel epidemiological situation in the southern hemisphere. At present, *Ae. albopictus* is endemic to Australian territorial islands in the Torres Strait, the channel that separates Papua New Guinea from northern Queensland, a gap of only 150 kilometres at its narrowest point [6]. It may be therefore reasonably argued that it is not so much a question of if but when this mosquito lands on the Australian mainland. Of real concern, *Ae. albopictus* is known to tolerate cooler climates than does *Ae. aegypti* [7,8], a related species already endemic to north and central Queensland and which is the vector responsible for transmitting sporadic, local outbreaks of dengue in the tropical north, focused around the cities of Cairns and Townsville [9].

Due to the escalating effects of global warming since the turn of the millennium, the recently observed record temperatures across the planet, including Australia, are predicted to continue [10]. This incremental elevation in mean annual temperature may facilitate a slow southwards expansion of the ecological habitat range of *Ae. aegypti* towards more heavily populated urban conurbations in south east Queensland [11,12]. While this may in itself provoke disquiet, the effect of *Ae. albopictus* on the nation's public health once it arrives could be far more profound. It is predicted by climate change and entomology experts that its distribution will spread rapidly to more southern states – New South Wales, Victoria and South Australia – even reaching Tasmania [13,14]. Such is the ability of *Ae. albopictus* to withstand reduced temperatures its eggs might also survive the notably cold Canberra winter, thereby raising the real possibility of year-round transmission in newly colonized temperate regions of Australia [14].

In this scenario, several factors combine to raise concern in this high-income country regarding preventing transmission of arboviruses by *Ae. albopictus*: the presence of a competent mosquito vector; a largely non-immune human population; and a lack of citizens' involvement in reducing mosquito breeding [15]. An additional consideration is that *Ae. albopictus* is a noted aggressive pest, in that it is well adapted to urbanization [16], living in close proximity to human dwellings, colonising domestic containers, feeding during daylight and showing a distinct predilection for biting humans [17]. Therefore, even if a particular mosquito is not infectious at any given time its anthropophilic behaviour causes a nuisance, so the widespread presence of this species will impact on the outdoor lifestyle of the Australian public.

As climate change continues to alter the transmission landscape of arboviruses, the relative importance of *Ae. albopictus* will continue to grow [18]. While there is no need for immediate alarm, in order to improve vector surveillance, management and control in regions not historically affected by mosquito-transmitted viruses there is a clear call for increased awareness among individuals [19], reinforced by better integrated community engagement [20]. Furthermore, state and federal authorities should be urged to revise existing public health strategies to plan for such an impending threat. In this context it is reassuring that one of the Australian medical research and innovation priorities proposed by the advisory board of the Commonwealth Government's newly established Medical Research Future Fund is to "enhance and coordinate

research on national surveillance of and response to current and emerging infectious diseases [21].

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