SPATIAL SPREAD OF RESISTANCE TO ANTIMALARIAL DRUGS: A REACTION-DIFFUSION MODEL

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In [1], we have developed a simple mathematical model of the spatial spread of resistance to an antimalarial drug. It combines a compartmental epidemic model similar to the one introduced by R. Ross in [2], and spatial diffusion of mosquitoes as in the work of R. A. Fisher in population genetics [3]. The model determines the condition under which resistance can spread: the basic reproduction number of resistant parasites should be greater than the basic reproduction number of sensitive parasites. It follows that there is a threshold level of antimalarial drug use above which resistant parasites can spread. The model also provides an expression for the speed of propagation. This work is a first attempt towards more practical questions such as: above which level of resistance should a cheap but inefficient drug such as chloroquine be replaced by efficient but more expensive drugs such as artemisinine derivatives?

References

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