Temperature dependent model of the extrisinc incubation period (EIP)

The proportion of the EIP completed daily was calculated using a model developed by Jetten & Focks (1997) modified to estimate the completion of EIP in each hour:

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where

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r(Th) represents the development rate (hr−1) at temperature T (°K) at hour h, p(25°C) is the development rate (hr−1) at 25°C assuming no temperature inactivation of the critical enzyme, ΔH\*A is the enthalpy of activation of the reaction that is catalyzed by the enzyme (cal/mol), ΔH\*H is the enthalpy change associated with high temperature inactivation of the enzyme (cal/mol), T0.5H is the temperature (°K) where 50% of the enzyme is inactivated by high temperature, R is the universal gas constant (1.987 cal/mol/°C), and CD, represents cumulative development. The parameters were modified to match the EIP given in Focks et al. (2006), and to include a temperature of 40°C as a limit for mosquito survival (p(25°) = 0.003; ΔH\*A = 13,000; ΔH\*H = 110,000; T0.5H = 313) as shown in Figure A.

Figure A. Proportion of the EIP completed per day as a function of mean daily temperature.

Proportion of EIP

Mean daily temperature (°C)

As the daytime temperature range might affect development (Lambrechts et al., 2011), minimum and maximum temperature data was interpolated to obtain two hour intervals. A linear rise between 6 am and 2 pm (i.e. the time of minimum and maximum temperature, respectively) and a linear fall from 2 pm to 6 am of the following day was used. Thus r(Th) was calculated for 12 two hours’ intervals multiplied by 2 and added up.

References:

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Lambrechts L, Paaijmans K, Fansiri T, Carrington L, Kramer L, Thomas M, Scott T. 2011. Impact of daily temperature fluctuations on dengue virus transmission by *Aedes aegypti*. *Proceedings of the National Academy of Science USA* 108:7460-7465.