

Chemical-Free Bite Proof Textiles

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Malaria kills more than 600,000 people every year, which makes mosquitoes the deadliest animal in the world. Long-lasting insecticide treated nets and indoor residual sprays have been the principle methods of protection from *Anopheles* mosquito bites.. There are three major drawbacks for the current insecticide-based methods: 1) mosquitoes are rapidly developing biological resistance to existing insecticidal chemistries; 2) these chemical treatments have a limited life span, which will result in decreased protection and subsequent outbreaks of malaria; and 3) most importantly, these treatments are toxic and long-term exposure is potentially harmful to human health. **A personal protective garment or device made from a non-toxic, comfortable, and effective insect resistant textile would be a potent weapon in the war against malaria and ultimately have the potential to provide health and economic benefits for millions of people worldwide.**

A predictive model for a non-insecticidal textile barrier fabric was established based on the anatomy of two mosquito species: *Anopheles gambiae* and *Aedes aegypti*. The model predicted the two major variables of the targeted textile structure, thickness and pore size. An *in vitro* mosquito assay with both mosquito species was developed to validate the modeling results using prototypes with controlled thicknesses and pore sizes. The results of the mosquito assays fit the predictive model perfectly, which proved that the model can be used for further structure optimization of non-insecticidal insect resistant textiles.