Mosquito Meets Crystal

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Almost 3 billion long-lasting insecticidal bed nets (LLINs), distributed between 2000-2020, have saved an estimated 8 million lives otherwise lost to malaria, but progress has been undone due to insecticide resistance, COVID-19 disruptions in services, as well as our failure to understand how chemically activated nets function. Net insecticides function by direct contact of *Anopheles* malaria-transmitting mosquitoes with crystallites or other solids that have bloomed on the nets surfaces. On the strength of our discoveries of polymorph- dependent lethality, and most recently on our demonstration that we can compromise the most resistant mosquito strains from West Africa by simple thermal transformations of polymorphs of net insecticides dispersed on chalk dust, we likewise will apply the science of solid-state chemistry to the manufacture more active nets themselves. Controlling malaria with bed nets comes down to controlling molecular crystallization. Bed nets are typically studied after manufacture. We have been extruding poly(ethylene) fibers in the lab so that we can study the blooming of insecticide from t=0 after extrusion. Crystals grown within and on threads are typically small. To achieve our aims, we must do microcrystallography, sometimes on submicron particles, which is now enabled by the rise of 3D electron diffraction for small molecule crystal structure.

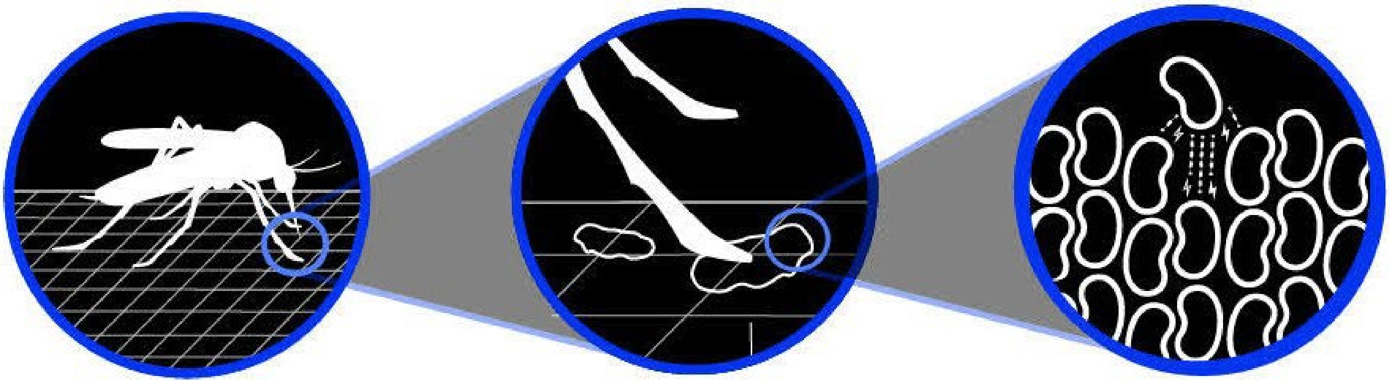

Figure 1

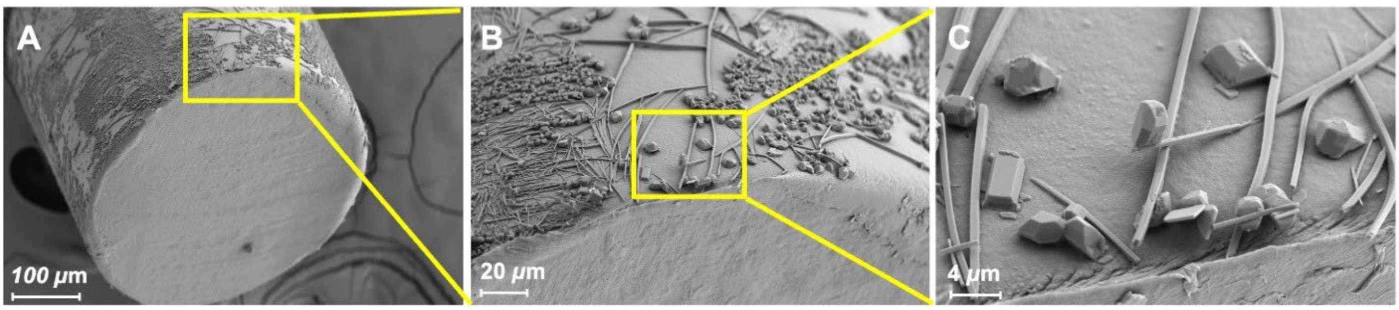

Figure 1