NIRS Model Trained on Lab-reared Mosquitoes Estimates Age of Wild Mosquitoes with 67% similarity to Ovary Dissection Method (Detinova)

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Different studies have demonstrated that near-infrared spectroscopy (NIRS) accurately classifies the age of lab-reared mosquitoes with accuracy greater than 80%. Despite the ability of near-infrared spectrometry to classify the age of lab-reared mosquitoes, it is unknown if NIRS can classify the age of wild mosquitoes because we lack age-labeled wild mosquitoes with which to train a model. Training a model using labels from ovary dissection yields a model with poor accuracy. Applying a model trained on spectra from lab-reared mosquitoes to estimate the age of wild mosquitoes was unjustifiable until Milali et al. ran a cluster analysis on a mixture of spectra collected from lab-reared and wild mosquitoes of the same species. They found no clear difference between spectra collected from lab-reared mosquitoes and those collected from wild mosquitoes.

Referring to the Milali et al. study, we applied a classification model trained on lab-reared *An. arabiensis* to classify the ages of wild *An. arabiensis*. Because we lack age labels of wild *Anopheles arabiensis*, we cannot directly validate the accuracy of the model. Alternatively, we indirectly validated our model by comparing the number of mosquitoes in each age class obtained when classification was done using our model and when done using Detinova ovary dissection. Our model classified 86% of the total 927 wild mosquitoes as young (less than seven days old) and 14% as old (greater or equal to seven days old). Detinova ovary dissection classified 72% of the same number (927) of mosquitoes as young (not laid eggs) and 28% as old (laid eggs). A Jaccard similarity analysis comparing Detinova ovary dissection and our model trained on lab-reared mosquitoes shows there is a 67% chance that the two methods will classify a mosquito into the same age class and a 33% chance they will classify a mosquito into different age classes. Hence, a classification model trained on lab-reared mosquitoes and Detinova ovary dissection are more similar than they are different.