*Statistical Analysis*

To determine the immunity change of ACO1-5 populations and CO1-5 populations when introduced to fungus *B. bassiana*, we used the exponentiated-Weibull regression model (…) with Markov chain Monte Carlo (MCMC) sampling methods Gibbs sampler (…) and Metropolis-Hastings (…) algorithm to assess properties of survival function, hazard ratio, and percentage of change on scale parameters as a measurement for immunity. It assumes the time to death of a fly follows a exponentiated-Weibull distribution with shape parameters , and scale parameter , where the scale parameter is a exponentiated linear combination of covariates treatment, sex, age groups, and any interaction terms. Using prior distributions and , the sampling methods simulated 800,000 to 1,000,000 draws from posterior distributions of . First 200,000 to 300,000 draws before convergence had been burned in. The remaining and convergent draws had been diagnosed for autocorrelation and thinned by taking one draw every 200 to 250 iterations to reduce the final autocorrelation in the samples.

After MCMC diagnosis, there are at least 2,000 draws for . Using the final simulated draws, we computed the estimates and 95% credible intervals of shape parameters, covariate coefficients, survival functions, and hazard ratios.

Also, the simulated data allows us for the percentage of change on scale parameters ’s as a measurement of immune defense. Holding the shape parameters as constant, the survival function is stretched out to the right as increases in value and pushed toward the initial experiment day as decreases in value. Hence, we first computed and for an infected group and an uninfected group of the same population at the same age, for example ACO at age 14. Next we computed to quantify the percentage of change between an infected group to the uninfected using scale parameters. If the quantity is smaller enough compared to another, this group has better immunity. For example, the one of ACO at age 14 is smaller than the one of ACO at age 28, we conclude that the immunity of ACO at age 14 is better than the immunity of ACO at age 28.