Building COMET - Vector Competence Experimental Testing: a database for meta-analyses of vector competence

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ABSTRACT
Many recent emerging pathogens are arboviruses, with over one-third of the world’s population at risk for infection. Laboratory-based mosquito infection experiments are often the best way to measure vector competence, and arbovirus-mosquito experimental testing data are critical to understand outbreak risk. There are challenges with experimental studies, and despite having been collected and reported for a large range of vector-pathogen combinations, terminology is inconsistent, records are scattered across studies, and accompanying publications often share data with insufficient detail for meta-analyses or synthesis. There is a need for a vector competence data standard for reporting, which aligns with a broad effort across scientific disciplines to preserve data for future use, recover existing data that may be unsearchable, and establish open principles for harmonizing that data to better leverage the effort of the larger community of research. We recently published a minimum data standard for vector competence experiments which strikes a balance between completeness and labor-intensiveness with the goal of making these important experimental data easier to find and reuse, without much added effort for those generating the data. We are building a vector competence experimental testing (COMET) database compiling standardized data on infection, dissemination and transmission of mosquito-borne viruses. We will perform meta-analyses to decompose extrinsic (temperature, other unaccounted-for experimental variability) and intrinsic (mosquito-omics, viral-omics) drivers, with a focus on mosquitoes and flaviviruses. We will describe the database structure, data types and formatting, and preliminary meta-analyses.

CONCLUSIONS
Standardizing vector competence results and depositing them in a shared database will allow meta-analyses, machine learning, and more, allowing us to better understand and predict mosquito-arbovirus compatibility and vector competence. Results from testing predictions in the laboratory will feedback to improve the models to more accurately predict which mosquitoes may transmit which viruses, and the role temperature, co-infection, virus sequence, etc. might have in those relationships.

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Figure 1. Outbreaks often result in laboratory studies to measure vector competence.

Figure 2. Experimental testing of arbovirus–mosquito pairs.

Figure 3. Adding vector competence results to testing database.

Figure 4. Minimum data standard for vector competence experiments.

Figure 5. Extracting experimental metadata from publications.

Figure 6. CSU and CDC vector competence publications.