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ABSTRACT

The Biological and Emerging Infections Research Resources Program (BEI Resources) developed by the National Institute of Allergy and Infectious Diseases (NIAID) functions as a centralized bioresource for the accessibility of reference strains of arthropod vectors to the global public health scientific community (www.beiresources.org). The BEI Vector Resources program currently provides over 60 colonies of live mosquitoes as well as Ixodid and soft ticks, sandflies, black flies, and triatomines. These vectors are competent hosts for transmission of blood-borne arboviruses, bacterial, and parasitic pathogens including Dengue, Zika, Powassan viruses, Rocky Mountain Spotted Fever rickettsia, Lyme borreliosis bacteria, Chagas, Leishmania, Babesia, and malaria parasites. Catalog holdings cover different stages of live insects, transgenic strains expressing reporter genes, nucleic acids, plasmids, and cell banks. Methods and protocol manuals for mosquito, tick, and sandfly insectary management and research are available for free download from the BEI Resources website. Part of our community outreach includes webinars to discuss current procedures for the care and maintenance of insect colonies in the laboratory and examples of investigator-led research projects enabled by BEI Vector Resources. This presentation will provide an overview of the biological resources available to the researcher, the benefits of depositing and registering with BEI Resources, and an assessment of publications from investigators utilizing arthropod vectors and associated reagents from the repository. The support from BEI's Vector Resources remains critical in research focused on the elucidation of the mechanisms used by highly adapted vector-borne pathogens to block or subvert host processes and the development of therapies and vaccines.

MISSION OF BEI RESOURCES

- BEI Resources provides NIAID and registered researchers worldwide with a central repository for the acquisition, authentication and distribution of a broad range of unique and quality assured pathogen research materials that will aid in the development and evaluation of vaccines, therapeutics, and diagnostics (Fig 1).
- BEI Resources covers NIAID Category A, B and C priority pathogens, including emerging infectious disease (EID) pathogens, arthropod vectors and reagents.
- Available arthropod Vector Resources materials include mosquitoes, sand flies, ticks, and triatomines, species known to be competent for transmission of viral, parasitic, and bacterial EID pathogens.
- Investigators can register at www.beiresources.org for free access to research materials at no cost. Institutional review and approval is required for MTA and for required material biosafety level classification.

Figure 1. BEI Resources procures, expands, authenticates and distributes research strains and reagents for investigators conducting pathogen and vector research.



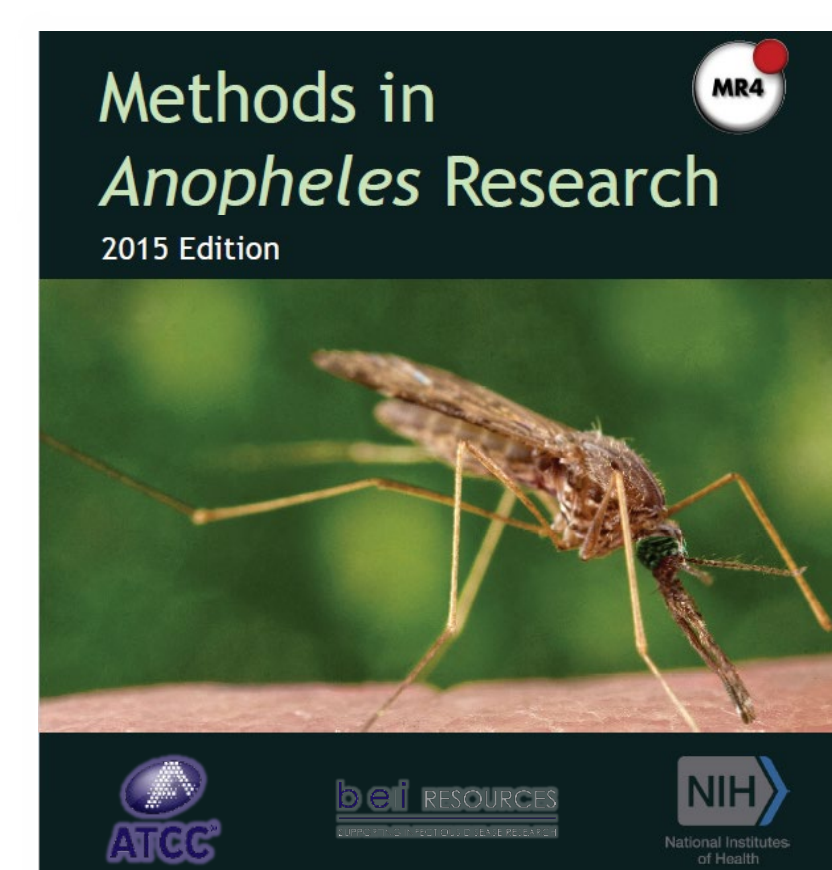
ARTHROPOD VECTOR RESOURCES

Vector	Species Represented	Products
Mosquitoes	<ul style="list-style-type: none"> • <i>Aedes aegypti</i> • <i>Aedes albopictus</i> • <i>Anopheles albimanus</i> • <i>Anopheles arabiensis</i> • <i>Anopheles atroparvus</i> • <i>Anopheles coluzzii</i> Ngouso • <i>Anopheles dirus</i> • <i>Anopheles farauti</i> • <i>Anopheles freeborni</i> • <i>Anopheles funestus</i> • <i>Anopheles gambiae</i> • <i>Anopheles gambiae</i> • <i>Anopheles merus</i> • <i>Anopheles minimus</i> • <i>Anopheles quadriannulatus</i> • <i>Anopheles quadrimaculatus</i> • <i>Anopheles stephensi</i> • <i>Culex quinquefasciatus</i> • <i>Culex tarsalis</i> 	<ul style="list-style-type: none"> • Live Mosquitoes (eggs) • Preserved Mosquitoes • Transgenic strains • DNAs and RNAs • Library clones • Primer sets • rDNA standards • Cell lines
Sand Flies	<ul style="list-style-type: none"> • <i>Lutzomyia longipalpis</i> • <i>Phlebotomus papatasi</i> • <i>Phlebotomus duboscqi</i> • <i>Phlebotomus sergenti</i> • <i>Phlebotomus arabicus</i> 	<ul style="list-style-type: none"> • Larvae (L3) / Pupae • Adult
Ticks	<ul style="list-style-type: none"> • <i>Amblyomma americanum</i> • <i>Dermacentor variabilis</i> • <i>Haemaphysalis longicornis</i> • <i>Ixodes pacificus</i> • <i>Ixodes ricinus</i> • <i>Ixodes scapularis</i> • <i>Rhipicephalus sanguineus</i> 	<ul style="list-style-type: none"> • Larvae • Nymph • Adult
Reduviids	<ul style="list-style-type: none"> • <i>Rhodnius prolixus</i> 	<ul style="list-style-type: none"> • Larvae • Adult
Black flies	<ul style="list-style-type: none"> • <i>Simulium vittatum</i> 	<ul style="list-style-type: none"> • Eggs • Larvae • Adult

Research Resources for Arthropod Vector Biology

- BEI Resources provides free of charge insectary protocol manuals for mosquitoes, ticks, fleas and sand flies, containing an array of insectary management and experimental approaches for Arthropod Vector Biology.

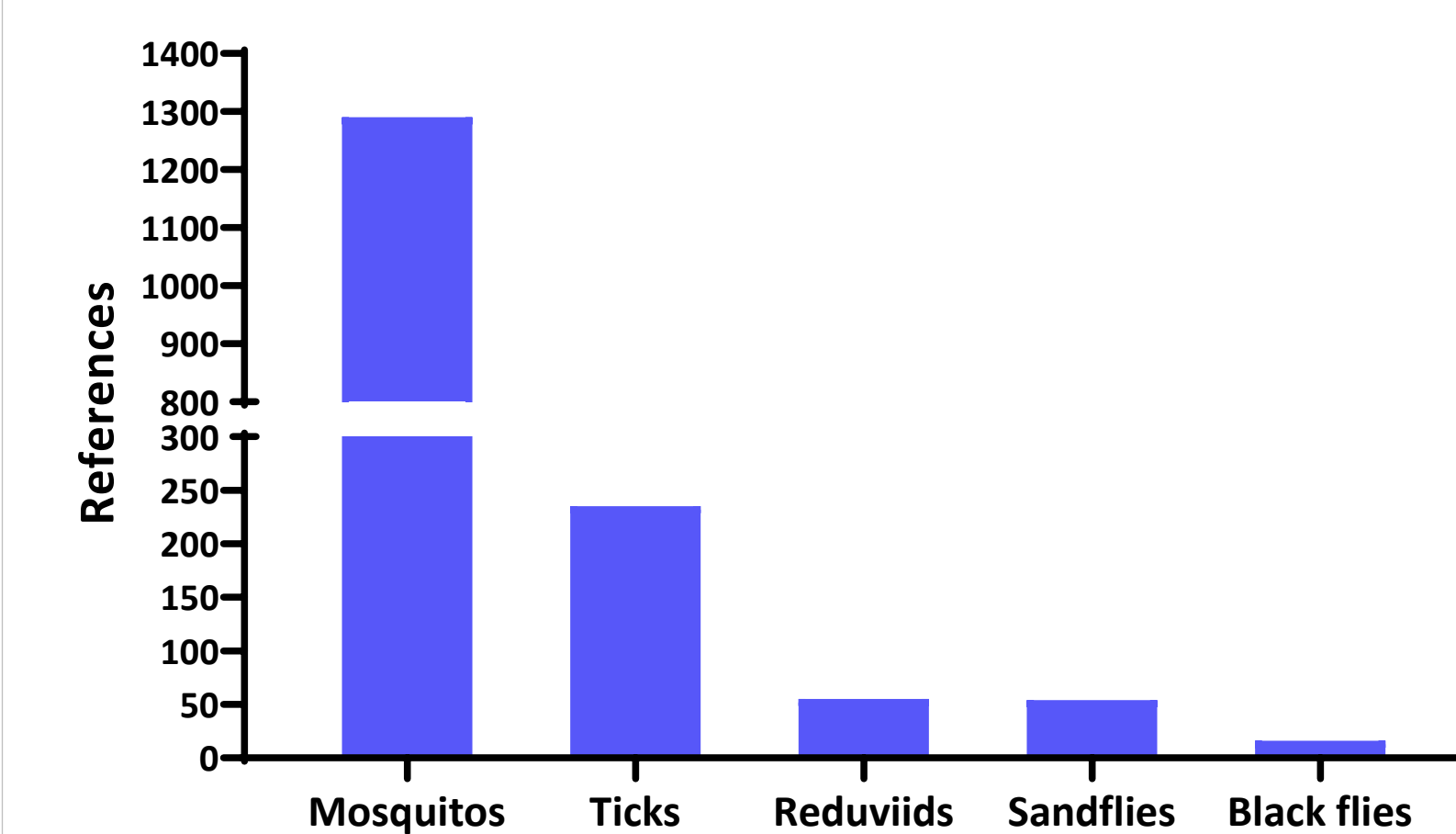
www.beiresources.org/Catalog/VectorResources.aspx



EXAMPLES OF ARTHROPOD VECTOR COMPETENCE

BEI Vector	Pathogen Transmission Competence
<ul style="list-style-type: none"> • <i>Culex quinquefasciatus</i> (Southern house mosquito) • <i>Culex tarsalis</i> YOLO (Western encephalitis mosquito) • <i>Rhodnius prolixus</i> (Assassin bug) • <i>Phlebotomus papatasi</i> PPNS (Sand fly; Egypt) • <i>Lutzomyia longipalpis</i> LLJB (Sand fly, Brazil) • <i>Ixodes scapularis</i> (deer / black legged tick) 	<ul style="list-style-type: none"> St. Louis encephalitis (SLEV), West Nile (WNV), Rift Valley Fever (RVFV), <i>Wuchereria bancrofti</i> (filariasis). WEEV, SLEV, WNV, RVFV, CEV, avian <i>Plasmodium</i> spp. <i>Trypanosoma cruzi</i> (Chagas' Disease) <i>Leishmania major</i> (Cutaneous Leishmaniasis), Phlebovirus serotypes Naples virus, Sicilian virus, Toscana virus (Pappataci/Sand fly Fever) <i>Leishmania infantum chagasi</i> (Visceral Leishmaniasis) <i>Borrelia burgdorferi</i>, <i>Anaplasma phagocytophilum</i>, <i>Ehrlichia muris-like</i> agent, Powassan virus, <i>Babesia</i> spp.

VECTOR RESOURCES CITATIONS 2013-2023



Search terms performed in Google Scholar

- Mosquitoes:** Aedes OR Anopheles OR Culex AND BEI Resources
- Ticks:** Amblyomma OR Dermacentor OR Ixodes OR Rhipicephalus AND BEI Resources
- Reduviids:** Rhodnius OR Triatomine OR Reduviid AND BEI Resources
- Sand flies:** Lutzomyia OR Phlebotomus AND BEI Resources
- Black flies:** Simulium AND BEI Resources

SUMMARY

- BEI Resources provides vector and pathogen research materials for investigators worldwide. Metrics on program usage are critical for assessment and continued resource availability.
- As a program requirement, literature citations to BEI Resources materials define arthropod vector strain origin and provide depositor recognition.
- Program usage based on research publications indicate that materials are used for vector biology and genetics research, pathogen transmission models, and vector control strategies.



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