III. BACTERIAL PATHOGENS OF CULICIDAE (MOSQUITOS)[a]

Samuel Singer

Department of Biological Sciences
Western Illinois University
Macomb, Illinois 61455, USA

[a] The literature for this table and bibliography covers the period 1976–May 1978.

BACTERIAL PATHOGENS OF CULICIDAE (MOSQUITOS)

Host	Host stage infected	Pathogen	Locality	Lab. or field study	Reference
Aedes aegypti	Larvae	Bacillus thuringiensis serotype H-14	Israel	Lab.	Goldberg & Margalit (1977)
Anopheles gambiae	"	B. sphaericus (SSII-1)	Nigeria	"	Singer (1977)
"	"	" (1404-9)	"	"	"
"	"	" (1593-3)	"	"	"
Anopheles sergentii	"	B. thuringiensis serotype H-14	Israel	"	Goldberg & Margalit (1977)
Culex nigripalpus	"	B. sphaericus (SSII-1)	USA	"	Ramoska et al. (1977)
"	"	" (1404-9)	"	"	"
"	"	" (1593-4)	"	"	"
"	"	" (SSII-1)	"	Field	"
"	"	" (1404-9)	"	"	"
"	"	" (1593-4)	"	"	"
Culex pipiens	"	B. thuringiensis (23 strains)	"	"	Hall et al. (1977)
"	"	" serotype H-14	Israel	Lab.	Goldberg & Margalit (1977)
Culex quinquefasciatus	"	B. sphaericus (SSII-1) (Chloroform treated)	USA	Field	Davidson et al. (1977)
"	"	" (SSII-1)	"	"	Singer (1977)
"	"	" (1404-9)	"	"	"
"	"	" (1593-4)	"	"	"
"	"	B. thuringiensis (23 strains)	"	"	Hall et al. (1977)
Culex tarsalis	"	B. thuringiensis (26 strains)	"	Lab.	"

BACTERIAL PATHOGENS OF CULICIDAE (MOSQUITOS) (continued)

Host	Host stage infected	Pathogen	Locality	Lab. or field study	Reference
Culex univitattus	Larvae	B. thuringiensis serotype H-14	Israel	Lab.	Goldberg & Margalit (1977)
Psorophora columbiae	"	B. sphaericus (SSII-1)	USA	"	Ramoska et al. (1977)
"	"	" (1593-4)	"	"	"
"	"	" (SSII-1)	"	Field	"
"	"	" (1404-9)	"	"	"
"	"	" (1593-3)	"	"	"
Uranotaenia unguiculata	"	B. thuringiensis serotype H-14	Israel	Lab.	Goldberg & Margalit (1977)

ABSTRACTS

*Davidson, E. W. (1977) Pathogenesis of Bacterial Diseases of Vectors. In: Biological Regulation of Vectors, pp. 19-30, DHEW Publication No. (NIH) 77-1180

Discusses pathogenesis of Bacillus sphaericus toxin. Insecticidal activity comes from a toxin closely associated with the bacterial cells. Apparently the toxin is released within the gut, passes the peritrophic membrane and intoxicates the larvae. Some population dynamics of the pathogen aredescribed.

*Davidson, E. W. et al. (1977) Effect of Bacillus sphaericus strain SSII-1 on honey bees, Apis mellifera. J. Invertebr. Pathol., 29: 344-346

The B. sphaericus entomopathogenic strain SSII-1 were fed to newly emerged bees and to the bee colonies. No effect was found on longevity of newly emerged bees nor on the brood production of colonies.

de Barjac, H. (1978) Une nouvelle variété de Bacillus thuringiensis très toxique pour les moustiques. C. R. Acad. Sc. Paris, 286 (13 mars, 1978) Serie D-797-800

A new strain of B. thuringiensis is described, the flagellar antigen of which is a new one named H14. This strain produces unusual crystals, with all shapes and sizes, and shows a high toxicity for larvae of Aedes aegypti.

*Goldberg, L. J. & Margalit, J. (1977) A bacterial spore demonstrating rapid larvicidal activity against Anopheles sergentii, Uranotaenia unguiculata, Culex univitattus, Aedes aegypti and Culex pipiens. Mosq. News, 37: 355-358

Describes the isolation of a Bacillus active against mosquito larvae. See de Barjac, H. (1978) for a more definitive identification.

*Hall, I. M. et al. (1977) The pathogenicity of strains of Bacillus thuringiensis to larvae of Aedes and Culex mosquitoes. Mosq. News, 37: 246-251

127 strains of Bacillus thuringiensis representing 16 varieties (and serotype groupings) were assayed against larvae of Aedes aegypti, Ae. triseriatus, Culex tarsalis, Cx. pipiens and Cx. quinquefasciatus. Most strains were only moderately active (LC_{50} of about 100 μg/ml), 26 strains showed marked effects against the most susceptible hosts, Ae. triseriatus, Cx. tarsalis and Ae aegypti, with LC_{50} values below 1 μg/ml. Some were active at 0.04-0.06 μg/ml. Some of these strains may be of interest in the future.

Myers, P. & Youston, A. A. (1978) Cell wall structure of an entomocidal strain of Bacillus sphaericus. In: Spores VII. Glenn Chamblis & James C. Vary. ed., American Society for Microbiology, Washington, D. C., 31-33

Thin sections of the mosquito pathogen Bacillus sphaericus SSII-1 revealed neither the presence of any parasporal body nor any obvious differences in cell wall profile of SSII-1 cells and a non toxic strain. The function of the outermost cell wall layer in mosquito pathogenicity of B. sphaericus is still a matter for speculation.

*Ramoska, W. A. et al. (1977) Bioassay of three strains of Bacillus sphaericus on field-collected mosquito larvae. J. Invertebr. Pathol., 30: 151-154

Field collected Ps. columbiae, Cx. nigripalpus and Ae. taeniorhynchus larvae were tested for sensitivity to B. sphaericus strains 1593, 1404 and SSII-1. All three strains were highly active against Psorophora and Culex species. Ae. taeniorhynchus was also susceptible but required higher dosages to achieve lethal response - 75% of the mortality that occurs on exposure to B. sphaericus occurs within 48 hours after incubation with the bacterium. With Ps. columbiae larvae, a decrease in susceptibility to the bacillus has been observed with increase in larval age (instar).

*Ramoska, W. A. et al. (1978) Field application of a bacterial insecticide. Mosq. News, 38: 57-60

Bacillus sphaericus entomopathogenic strain SSII-1, 1404-9 and 1593-4 were applied to field populations of Culex nigripalpus larvae. Field populations of Psorophora columbiae were treated with strain 1593-4. In the three experiments larval populations were reduced by nearly 90%.

*Singer, S. (1977) Isolation and Development of Bacterial Pathogens of Vectors. In: Biological Regulation of Vectors, pp. 3-18, DHEW Pulbication No. (NIH) 77-1180.

Reviews work with the development of B. sphaericus strains, against mosquito larvae, up to 1975. Discussion deals with problems of isolation and developments of bacterial pathogens of vectors.