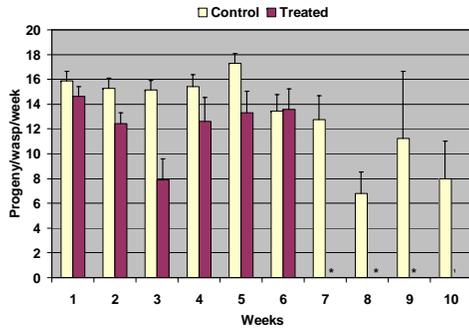
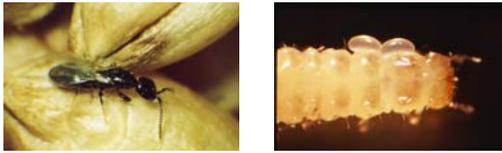


Jeffrey Lord  
USDA-ARS, Manhattan, KS



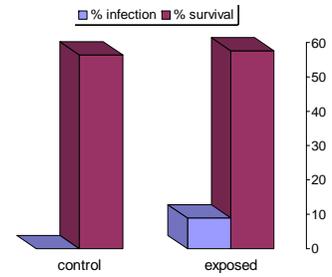
Progeny production of *Cephalonomia tarsalis* after exposure to *Mattesia oryzaephili*. (week in which death occurred not included)



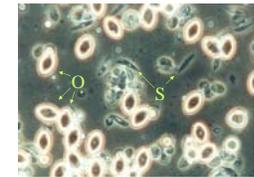
The rusty grain beetle, *Cryptolestes ferrugineus*, and the sawtoothed grain beetle, *Oryzaephilus surinamensis*, are among the most abundant cosmopolitan pests of stored grain. The beetles are attacked by the bethylid parasitoids, *Cephalonomia waterstoni* and *Cephalonomia tarsalis*, respectively, well as by the neogregarine *Mattesia oryzaephili*. This study was an effort to determine how these beneficial species would interact. Did the parasitoids become infected? Would infection render the wasps ineffective biological control agents, or would they act as reservoirs and vectors, while continuing to prey on and parasitize beetle larvae? To answer these questions, the wasps were exposed to *M. oryzaephili* by confinement with visibly infected (fluorescent) fourth instar beetle larvae, then confined with healthy hosts and monitored for survival, infection and oviposition. Transmission to beetle larvae by the attack of wasps that had been exposed to infected beetles (mechanical) and via the residue on grain in which wasps had been incubated after attacking infected beetles were also assessed. Infections were determined microscopically.

**Findings:**

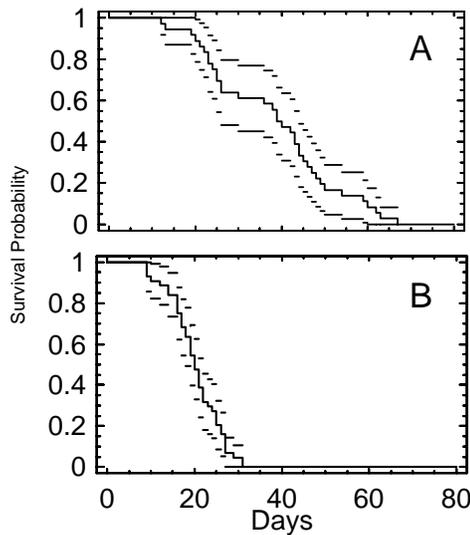
- *Mattesia oryzaephili* was transmitted per os to 87% of *C. waterstoni* females and 92% of *Cephalonomia tarsalis* females when they feed on infected hosts.
- Male wasps do not attack the beetle larvae and did not become infected.
- The mean survival times after exposure were 36 d for diseased *C. waterstoni* and 20 d for diseased *C. tarsalis*, while the mean survival times for control *C. waterstoni* and *C. tarsalis* were 46 d and 38 d, respectively.
- The wasps oviposit on beetle larvae that have early stage infections, and their progeny succumb to the infection, they do not oviposit on beetle larvae with late stage infections that are macroscopically visible under ultraviolet illumination.
- Wasps can disseminate the inoculum through their frass and via their cadavers after infection and death.
- Attempts to achieve transmission by stinging were not successful.
- It is proposed that *Cephalonomia* spp. can be used as a means to inoculate *M. oryzaephili* into pest grain beetle populations and aid in its dispersal.



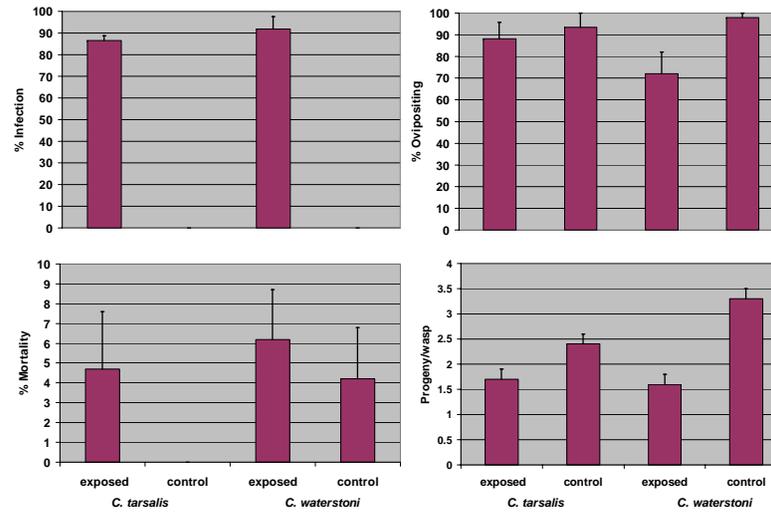
Percent survival and infection of *O. surinamensis* larvae exposed from hatch to grain that was contaminated by *C. tarsalis* after they had attacked *M. oryzaephili*-infected beetles.



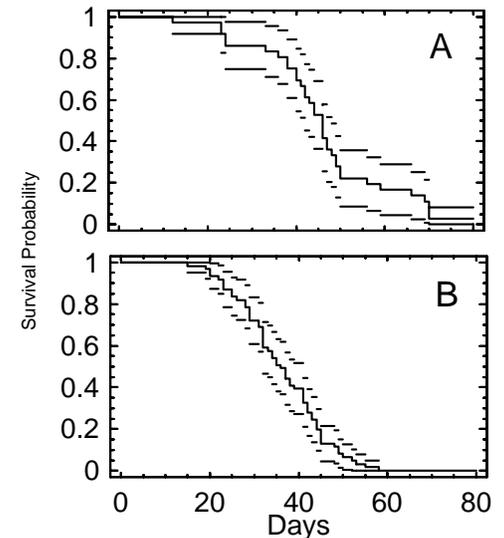
*Mattesia oryzaephili* oocysts (O) and sporozoites (S)



Survival trends of healthy (A) and *Mattesia oryzaephili*-infected (B) female *Cephalonomia tarsalis* from the first day of exposure.



*Cephalonomia tarsalis* and *C. waterstoni* mortality, infection, and oviposition 14 days after feeding on *Mattesia oryzaephili*-infected host larvae. (Oviposition from 7-14 days post-exposure)



Survival trends of healthy (A) and *Mattesia oryzaephili*-infected (B) female *Cephalonomia waterstoni* from the first day of exposure.