Biology and epidemiology of *Phaeoacremonium spp.(Togninia spp.)* the cause of esca and young esca *and Phaeomoniella chlamydospora* the cause of Petri disease (syn: Young vine decline) in California

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Esca and Petri disease have been documented in all of the major viticulture production regions in California. These grapevine diseases can cause significant economic loss due to vineyard replanting and yield and quality loss. The fungal pathogens causing these diseases have been documented in vineyards for at least 100 years, and have been identified in vineyards in every grape growing region in the world. Large losses due to replanting have occurred, especially severe in northern California replant vineyards and table grape vineyards. *Phaeomoniella chlamydospora* is the cause of Petri disease but esca can be caused by both *Phaeomoniella chlamydospora* and numerous species of *Phaeoacremonium* which include *Phaeoacremonium aleophilum (Togninia minima*) *Pm. viticola (T. viticola), Pm. angustius Pm. mortoniae (Togninia fraxinopennsylvanica), Pm. parasiticum, Pm. rubrigenum.* These fungi are responsible for poor vineyard establishment in many newly-planted vineyards. The infection courts for these fungi are generally the xylem parenchyma and vessels of mature grapevine xylem. It is suspected that the pathogens may be passed from mother vines to progeny vines via spores carried either in the sap or by external contamination of bark in nurseries or in production fields after planting and pruning.

Typical symptoms of esca are purple to brown spotting of berries, the presence of interveinal and marginal necrosis of leaves that may develop into a tiger-striped pattern. Some diseased grapevines wilt suddenly (apoplexy or acute esca). Esca has a remarkable characteristic of discontinuity in foliar and fruit symptom expressionfrom year to year. Based on pathogenicity studies, this now is assumed to occur because of timing of infections. We have been able to reproduce symptoms of esca on berries for the first time.

Currently, it is known that these fungi are present in propagation material coming from mother plants in nurseries. However vines also apparently become infected during the propagation procedure. A detection method using nested-PCR was developed to provide a rapid and sensitive test to determine the presence of these fungi in grapevine material throughout the propagation process.

Initial results of spore trapping studies showed that theses pathogens are aerially dispersed. This study elucidated how the fungi spread and under what condition the spores are being released. Pycnidia of *P. chlamydospora* were observed primarily on 2-4 year-old pruning wounds and beneath bark near pruning wounds or where vascular tissue had been exposed. Experiments will also be discussed on the ecology of the newly described teleomorph of *Phaeoacremonium* spp. This teleomorph is a pyrenomycete in the genus *Togninia*. This fungus is heterothallic. Molecular data comparing perithecia and progeny of teleomorphs to known *Phaeoacremonium* spp., indicate that this teleomorph is that of *Phaeoacremonium* spp. This teleomorph was identified in infected vineyards in California and the world for the first time in late 2004 and 2005. Perithecia were common on dead, decayed, xylem wood deep inside natural cracks or wounds made from pruning wounds. Ascospore release was also documented in the laboratory using video cinephotomicrography. Its mode of ascospore release, forcible discharge, suggests that ascospores play an important role in the disease cycle.

Spore trapping data and some speculation seem to indicate that symptom expression occurs in a year when new infections take place. Vineyard surveys over the past two years however, point to the possibility that symptom expression may not occur until the following year after infection. Correlations between symptom expression, rainfall and temperature will be presented.

It was demonstrated that pruning wounds are susceptible to infection by conidia of both *T. minima* and *P. chlamydospora*. The mechanism of ascospore release of *T. minima*, showed that aerially dispersed ascospores most probably were the primary source of inoculum in the disease cycle.

T. minima (*P. aleophilum*) was shown to be the most commonly observed fungus involved in esca. While other closely related species were shown to be pathogens, *T.minima* appears to be the most prevalent in symptomatic vines.

Potential control strategies will be discussed.