Variability and function of Vmp adhesion related proteins give insight into the emergence of phytoplasma epidemics.

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Phloemian bacterioses are associated to phytoplasmas, spiroplasmas or liberibacters that are transmitted by hemipteran sap-sucking insect vectors. Controls measures such as the rogguing of infected plants, certification of healthy material for planting, control of weed reservoirs and insecticide treatments against insect vectors are costly to implement and have social and environmental impacts. In order to reduce the use of insecticide, new methods must be developed to better trace pathways for spread and epidemic potential of bacterial strains. Variable membrane protein (Vmp) genes are powerful markers for tracing phytoplasma disease epidemics but their role in phytoplasma life cycle remains to be investigated. Genetic, ecological and cellular biology approaches have been undertaken to evaluate the impact of Vmps on phytoplasma biology. Since the first outbreaks, grapevine flavescence dorée epidemics had been associated to the introduction of the leafhopper vector *Scaphoideus titanus*, while Europe imported American phylloxera-resistant Vitis rootstocks. However, the geographical and ecological origin of the etiological agent, a phytoplasma, remained unclear despite evidences for a plant host-range not restricted to grapevine. The outcome of a European collaboration shows that this phytoplasma is endemic to European Alders and common in Clematis. Its emergence as an epidemic pathogen for grapevine is restricted to some genetic variants pre-existing in the wild plant host reservoir. The compatibility of this phytoplasma to the introduced S. titanus insect vector resulted from the preadaptation/compatibility of phytoplasma Vmps to other Deltocephalinae leafhoppers living on alders. Vmp organization is similar to adhesion related proteins (Arp) and the recombination ability of most phytoplasmas certainly favors the fast duplication of pre-adapted repeated domains. VmpA-coated fluorescent beads and recombinant *Spiroplasma citri* adhesion-defective mutant expressing VmpA, were used in ex vivo adhesion and in vivo ingestion assays. Results demonstrate that VmpA promotes adhesion to the epithelial cells of the leafhopper vector. This suggests a key role of Vmps in the life-style of phytoplasmas that rely on the adaptation to new insect vectors to expand their plant-host range.