



## First report of acute oak decline disease of native and non-native oaks in Switzerland

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In spring 2017, stem bleeds accompanied by necrosis of the inner bark and sapwood were reported on three trees of *Quercus petraea* in the region of Basel, Switzerland. In 2018 and 2019 the same symptoms were observed at seven other sites across the country on *Q. cerris*, *Q. pubescens*, *Q. robur* and *Q. rubra* (Figs. 1-2). Samples prepared from symptomatic lesions resulted in abundant bacterial growth when plated on nutrient agar. Colonies with different morphotypes were assessed by partial 16S rRNA and *gyrB* gene sequencing (Lane *et al.*, 1991; Brady *et al.*, 2008), available under GenBank Accession Nos. MT094254-MT094265 and MT108370-MT108380. Sequence comparisons indicated the occurrence of *Brenneria goodwinii*, *Gibbsiella quercinecans* and *Rahnella victoriana*. These three bacteria have been associated with a polymicrobial decline disease, termed acute oak decline (AOD) (Denman *et al.*, 2014). The presence of the bacteria in bark and sapwood samples was confirmed using a multiplex Taqman qPCR assay (Denman *et al.*, 2018).

For pathogenicity tests, bacteria were applied by stem cut inoculations (Green *et al.*, 2009) on two-year-old *Q. robur* plants. Treatments consisted of single and mixed inoculations using one strain per bacterial species and sterile water as a control. Three plants per treatment were inoculated with 5 µl of a 10<sup>8</sup> cfu/ml bacterial suspension and kept in a greenhouse at a temperature of 20 to 25°C. After eight weeks the first visual symptoms developed above and below the infection cut. Brownish discoloration and small lesions with oozing exudate were observed on plants inoculated with *B. goodwinii*/*G. quercinecans*, *B. goodwinii*/*R. victoriana* and *B. goodwinii*/*G. quercinecans*/*R. victoriana*. Plants treated with single strain inoculations with either strain or the mixed treatment *G. quercinecans*/*R. victoriana* showed variable degrees of stem discoloration but no lesions developed. After twenty weeks, necrotic tissue samples (Fig. 3) were tested using the Taqman qPCR assay. All bacteria of the initial treatment were detected, except in one plant inoculated with all three bacteria, which was dead at the time of sampling. In control treatments, none of the bacteria was detected, and plants remained healthy. To complete Koch's postulates, bacteria were successfully re-isolated on Gassner agar.

This is the first report of AOD in Switzerland associated with *B. goodwinii*, *G. quercinecans*, and *R. victoriana*. As AOD is of increasing concern in Great Britain and threatens native oaks, careful monitoring of this decline

disease in oak ecosystems is warranted.

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Figure 1

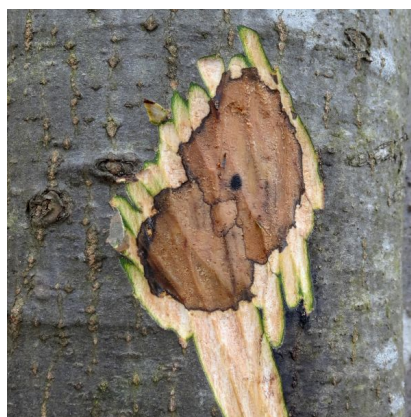


Figure 2



Figure 3

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