Adaptation of *Penicillium* fungi to dry cured meat

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An important goal in evolutionary biology is to unravel the phenotypic and genetic changes underlying adaptation to different environments. Domestication is a good model to study evolutionary processes, particularly adaptation, because it occurred recently and with strong selection. For studying adaptation, fungi are good models due to their small genome sizes, short generation time, and experimental tractability. In my PhD project, I focus on *Penicillium* fungi used in dry-cured meat production. During the production of dry-cured meat, molds are capable of growing because of their high lipolytic and proteolytic activities. They also increase dehydration by creating microspores and prevent lipid oxidation by covering the surface. Furthermore, during the ageing process, *Penicillium* molds participate to flavoring, in particular through the catabolism of animal fatty acids and proteins.

A first objective of my project was to assess whether the *Penicillium* species occurring frequently in dry-cured meat - *Penicillium nalgiovense* and *Penicillium salamii* - have adapted to this particular environment, with high salt, protein and lipid content. These two species are not sister species and are quite distantly related, showing a mean of eighty percent nucleotide identity along their genomes, raising the possibility that convergent/parallel adaptation might have occurred to thrive in dry-cured meat environment. These two species are also found in other environments. We have isolated *Penicillium* strains from dry-cured meat and have run fitness experiments on different media to investigate whether the species or populations occurring in dry-cured meat have a higher fitness in this environment. We found that the dry-cured meat populations of both *P. nalgiovense* and *P. salamii* had different traits than strains form non-dry-cured meat environments and than other, closely related species. Indeed, they show lower lipolysis and proteolysis activities and a slower growth. The second objective of the study was to assess the genetic diversity, population structure and possibly the mechanisms of adaptation using whole genome sequencing. In *P. salamii*, we found genetic differentiation between strains from dry-cured meat and those from other environments. These results altogether suggest that dry-cured meat populations evolved genetic differentiation and specific traits compared to other populations.