FEMS Maastricht, June 7-11, 2015

Listeria monocytogenes survival strategies: population heterogeneity and resistant variants

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The food-borne pathogen *Listeria monocytogenes* is a gram-positive microaerophilic facultative anaerobic rod and the causative agent of listeriosis. This pathogen is notorious for its robustness and a range of studies have been performed that supplied insight in adaptive stress response and survival strategies. Heterogeneity in stress response of bacteria is one of the biggest challenges posed by minimal processing, which aims at finding the balance between microbiologically stable foods while maintaining the characteristics of fresh products. This presentation will focus on assessment of *L. monocytogenes* population heterogeneity and the genotypic and phenotypic analysis of stress resistant variants obtained after high hydrostatic pressure, heat and acid exposure. Significant differences among variants were observed including level of acid resistance, growth rates at different temperatures, motility, and biofilm-forming capacity. These data point to differences in robustness and growth performance under food-relevant conditions. Whole genome sequencing analysis of *L. monocytogenes* wt and selected stress resistant variants revealed mutations in *ctsR*, encoding a class III heat shock repressor, and in *rpsU*, encoding ribosomal protein S21. Notably, the latter type of mutations was only found in the acid resistant variants. Cluster analysis of genotypic and phenotypic parameters revealed that a large population diversity exists even within one *L. monocytogenes* strain and that different adverse conditions select for different variants. The large population diversity of *L. monocytogenes* stress-resistant variants signifies the organism's genetic flexibility, which in turn may contribute to the survival and persistence of this human pathogen in food-processing environments. The diversity in stress-resistant variants underlines the importance of gaining more insight in the mechanisms underlying this heterogeneity and increased resistance.