The versatile effect of L- and D-Cateslytin on bacteria and yeast biofilms according to configuration, medium and dose

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L- and D-Cateslytin (CTL) are antimicrobial peptides (AMP) derived from chromogranin A, a protein of the stress response system. Their antimicrobial properties have been thoroughly characterized and already exploited in biomaterials. However, effects on biofilms of yeast and bacteria have never been specifically addressed. We have investigated the impact of both L and D configurations of CTL on the growth of biofilms formed by Candida albicans, Escherichia coli or Staphylococcus aureus microorganisms.

The study was conducted in different media and two strategies of treatment were tested, consisting of administrating the peptide either just at the beginning of biofilm development i.e. on just adhering pioneer microbial cells or on a biofilm already allowed to develop for 24h. We also considered whether the peptide was modified in contact with the medium or/and microbial metabolites. Planktonic and sessile populations of microbial cells were analyzed by spectrophotometry, crystal violet staining, MTT and confocal microscopy with staining by Syto9Ò and propidium iodide. Identification of the peptides and their derived fragments was investigated by HPLC and Mass-Spectroscopy.

In general, CTL-D exhibited higher antibiofilm performances than CTL-L. In addition, concentrations necessary to inhibit biofilm formation were found to vary from ten to eighty times the MICs determined in planktonic cultures. Nevertheless, the results also demonstrate that sessile microorganisms and biofilms are sensitive to CTL (L and D conformations) differently that planktonic populations. Significant (p-value < 0.01) effects were observed on both sessile and planktonic populations and with both strategies of treatments, but they highly varied with medium, species and CTL configuration. Typically, better antibiofilm effect than common antibiotics was reached in some specific conditions, while enhancement of aggregation or biofilm formation occurred in another medium and for other doses. Nevertheless,

Finally, this confirms the quality of CTL peptides as new antimicrobial agents and reveals their anti-biofilm properties. This also specifies the conditions of use necessary to benefit of the highest performances.