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Cystic fibrosis bacteria under variable oxygen tensions: biofilm formation ability and resilience to acute antibiotherapy

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Distinct availabilities of oxygen, nutrients and antibiotics in the cystic fibrosis (CF) airways have contributed to the colonization of a large polymicrobial community, which may have further repercussion in the development of chronic biofilms and in antibiotherapy. This study aimed to inspect whether CF-related bacteria - *Staphylococcus aureus* (Sa) and two less common species Acinetobacter baumanni (Ab) and Klebsiella pneumoniae (Kp), are able to develop *in vitro* biofilms and resist to ciprofloxacin under aerobic/hypoxic conditions. Thus, biofilm-cells were estimated by CFU counting and time-kill-curves determined by absorbance (planktonic) and CFU (biofilm). All species showed alike results for biofilm growth, with higher bacteria (~109 CFU/cm2) adhering under aerobiosis than for hypoxic atmospheres (~108 CFU/cm2) in 24 h. Regarding the susceptibility profiles, Sa was the most sensitive species (MIC/MBC: 0.5 mg/L), with Kp keeping the most resistant profile against ciprofloxacin (MIC: 16 mg/L; MBC: >512 mg/L). Planktonic and biofilm time-kill curves were equivalent for both atmospheres. Interestingly, ciprofloxacin affected notably Sa biofilms under both conditions (adhesion rates declining 4log from 1/4MIC to 4MIC), but Ab and Kp biofilms were not disturbed even by the presence of abnormal ciprofloxacin concentrations, preserving initial adhesion rates from 106 - 107 cells/cm2/h, respectively. Data highlighted that CF unusual species could persist under hypoxia and form biofilms resilient to ciprofloxacin currently applied in acute infections, eventually progressing for severe biofilms hard to eradicate with powerful antibiotherapy.

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