SURFACE PHYSICOCHEMICAL CHARACTERIZATION OF A BACTERIAL POPULATION ISOLATED FROM A DRINKING WATER DISTRIBUTION SYSTEM AND THERMODYNAMIC EVALUATION OF THEIR POTENTIAL TO ADHERE TO SEVERAL MATERIALS

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ABSTRACT

Autochthonous heterotrophic aerobic bacteria from drinking water were isolated, identified and characterized in terms of physicochemical surface properties (hydrophobicity). Additionally, eight different support materials were also characterized in terms of hydrophobicity. Concerning the surface properties of the isolated bacteria, from 27 different strains, belonging to 13 different species and 3 strains of the group IV class II of the CDC, only *Brevundimonas diminuta* was hydrophobic, being the remaining bacteria hydrophilic. Occurrence of surface properties variation within the same species were detected only for *Comamonas acidovorans*. However, hydrophilic characteristics were maintained within the different strains. All the materials tested were hydrophobic being the less hydrophobic glass and the most hydrophobic polyethylene (PE). The free energy of adhesion between the different bacteria and the support materials in aqueous medium was assessed and used to predict which material had a higher ability for bacterial adhesion and consequently for biofilm formation. This theoretical approach revealed that the support materials that favoured adhesion thermodynamically for a number of isolated bacteria equal or higher than 20 were stainless steel 304 (SS 304), copper, polypropylene (PP), PE and silicone, while adhesion was less favourable (number of bacteria equal or less than 7) for stainless steel 316 (SS 316), polyvinyl chloride (PVC) and glass.