Fluoroquinolone-based GUMBOS: synthesis, physicochemical characterization, and biological profile evaluation

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Antimicrobial resistance (AMR) has been considered a global public health threat worldwide[1] and strategic therapies are needed to replace ineffective antibacterials. One approach is the use of well-known antibacterials as active pharmaceutical ingredients along with adjuvants[2] that possess non-antibiotic properties but can extend the lifespan and enhance the effectiveness of the treatment, while also improving the suppression of resistance[3]. Ionic liquids (ILs)[4] and a group of uniform materials based on organic salts (GUMBOS)[5] present an alternative to this crisis allowing the combination of antibacterials with adjuvants. Resistance rates of fluoroquinolones (FQs), a family of antibacterial agents, are increasing[6]. Fashioning these compounds with different anions and thus different chemical structures may improve their properties and antimicrobial performance. Organic salts based on ciprofloxacin and moxifloxacin were produced via anion exchange reactions with lithium and sodium salts. Structural characterization was performed using NMR, FTIR, and ESI-MS. Thermal stability of the GUMBOS was assessed by TGA and DSC with compound dehydration in the range of 130-150 °C, and their oxidative decomposition between 250-350 °C. Octanol/water partition ratios were assessed to evaluate relative hydrophobicity with a log $K_{O/W}$ range of -1.110 to 1.086. Antibacterial activities against Gram-positive *S. aureus* and Gram-negative *E. coli* were evaluated through a micro-broth dilution method at concentrations of 0.25 and 25 $mg.L^{-1}$. Antibacterial activity of compounds was not statistically different from cationic counterparts, however, some GUMBOS were less cytotoxic to L929 mouse fibroblasts and non-hemolytic on human red blood cells. Therefore, these agents exhibited potential to be further investigated as an alternative approach to combine drugs for treating infections caused by resistant bacteria. This strategy promises to contribute to the ongoing battle against the increasing threat of AMR.

References

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