Sawdust: A potential bio-adsorbent for removal of antibiotics in contaminated water

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This study investigated the potential of sawdust as a bio-adsorbent for the removal of different classes of antibiotics. Representatives of carbapenems (i.e. meropenem) and fluoroquinolones (i.e. ofloxacin) antibiotics were selected for the study, based on a priority list recently compiled by the World Health Organisation. The levels of contamination similar to those reported for polluted sites were simulated by dispersing antibiotics in water at room temperature. UV/Vis spectroscopy was deployed to determine the concentration of antibiotics in water. Sawdust was washed, dried and conditioned, before undergoing physio-chemical pre-treatments with different aqueous solutions of inorganic salts, acids and base to produce a modified form. Batch experiments were set-up for the adsorption studies of the antibiotics using both unmodified and modified forms of sawdust. Parameters such as contact time of sawdust with adsorbates and pH level of adsorbate solutions were also investigated to optimise the water treatment processes. It was found that both unmodified and modified sawdust adsorbents are capable to reduce the concentration of the antibiotics dispersed in water by more than 30%. Modified sawdust was characterised by greater uptake of meropenem and ofloxacin than unmodified sawdust. This may be attributed to the improved accessibility of functional groups in modified sawdust. Sawdust pre-treated with an acid was the most effective in adsorbing both antibiotics. The optimum contact times between the adsorbent and adsorbates were found to be 18 hrs for meropenem and 6 hrs for ofloxacin. The adsorption of meropenem and ofloxacin was found to be favourable in acidic condition of adsorbates. The surface charge of the sawdust and the electrostatic force between the adsorbent and the antibiotics in acidic condition may be responsible for the adsorption efficiency. These preliminary results indicate that sawdust potentially can serve as an alternative bio-adsorbent suitable for removing different classes of antibiotics from contaminated water.

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