

## Comparison of adsorption of morphine and nicotine on some natural and synthetic adsorbents

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**Background and Aims:** Morphine and nicotine are the most commonly used drugs with the capability of inducing addiction. They mostly introduced to the human body by smoking, but contamination of water resources with these drugs is also common. One of the promising technologies will be the drug removal by adsorbents from the contaminated or contaminating resources. The main aim of this study was to evaluate and compare adsorption of nicotine and morphine by natural and synthetic adsorbents.

**Methods:** Various adsorbents prepared from natural wastes such as nutshells of pistachio, walnut, hazelnut and peach stone and some chemical adsorbents like activated charcoal (AC) and multi-walled carbon nanotubes (MWCNTs) were used to adsorb nicotine and morphine from aqueous solutions by both continuous flow column and batch type system. The parameters affecting the adsorption such as pH, temperature, time, interferences of similar molecules and the amount of adsorbent used were studied.

**Results:** Results showed that morphine and nicotine were adsorbed more than 90% on MWCNTs, whereas they are adsorbed less than 40% on AC. Adsorption on natural adsorbent were mostly greater than AC, and was very near and comparable to MWCNTs. Both morphine and nicotine obeyed the monolayer adsorption on the adsorbents and around 2 mg of the drugs can be adsorbed by each gram of the natural adsorbent. Results indicated that more than 94% of morphine and nicotine content of the solutions can be removed in less than 5 minutes.

**Conclusions:** Illicit drugs like morphine and nicotine can easily be removed by natural wastes that are very cheap and available compared to MWCNTs and can be fabricated to the filter to remove them before entering the human body.

**Keywords:** Nicotine; Morphine; MWCNTs; AC; Nutshell