# Removal of Amitriptyline from Aqueous Media Using Activated Carbons

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**ABSTRACT:** This paper reports the removal of amitriptyline, a widely used tricyclic anti-depressant, from aqueous solutions by six activated carbons produced from cork, coffee endocarp and eucalyptus pulp. The results of this study showed that samples from cork and eucalyptus pulp, activated at 800 °C, exhibited the highest adsorption capacity of 120 mg/g and 110 mg/g, respectively. Samples produced from coffee endocarp showed the lowest capacity. Amitriptyline adsorption was almost independent of the pH of the solution and occurred via three different mechanisms based on the dispersive and chemical interactions between amitriptyline molecules and the carbon surface.

## INTRODUCTION

Nowadays, mental health is one of the major concerns in most societies. Mental disorder is ranked by the World Health Organization (WHO) as the leading cause of disability, affecting more than 450 million people worldwide. This disease is of particular relevance for the youth population since, according to WHO, nearly 20% of children and adolescents across cultures around the globe are estimated to have similar types of mental disorders or problems (WHO 2001, 2011a,b).

Amitriptyline (AMT), a tricyclic antidepressant drug, is commonly used for the treatment of several mental conditions and is one of the oldest of its kind in the market. Despite being comparatively more toxic (particularly at low dosages) than the selective serotonin re-uptake inhibitors (SSRI), AMT is still extensively prescribed mostly due to its lower price.

AMT has a noteworthy environmental impact, due to the growing tendency for its careless disposal. AMT is considered a threat to environmental stability due to its persistence and biological activity (Santos *et al*. 2010). Additionally, its metabolites are expelled by the body and enter water courses on a daily basis. The presence of these chemicals in several aquatic settings can have acute or chronic toxic impacts on ecosystems, due to the accumulation of sub-therapeutic concentrations. Another factor to be considered is the possible synergistic interactions between AMT and other molecules present in water streams, which could lead to a significant negative impact on public health.

Several studies have demonstrated the existence of contamination by pharmaceuticals in surface and ground waters (Gross *et al*. 2006; Al-Rifai *et al*. 2011; Moldovan 2006; Vanderford *et al*. 2003). In particular, McQullian *et al*. (2002) have detected AMT in treated sewage effluents and surface water in New Mexico State in the U.S.A. Lajeunesse *et al*. (2008) have also reported

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