Interaction study of arsenic (III and V) ions with metallothionein gene (mt2a) fragment

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ABSTRACT

Arsenic is classified as a global pollutant and human carcinogen, to which humans are exposed, occurring in the environment coming from both natural and/or anthropogenic sources. The toxicity depends on the oxidation state or methylation level during the biotransformation in the organism, whereas oxidative stress induced by arsenic exposure is suggested as a potential mode of its carcinogenic action. Inorganic forms of arsenic appears in two biologically important oxidation states: As(V) (arsenate) and As(III) (arsenite), which are highly toxic. There are currently over 100 active clinical trials involving inorganic arsenic or organoarsenic compounds registered with the Food and Drug Administration (FDA) for the treatment of cancers. Arsenic trioxide is presently the most active single agent in the treatment of acute promyelocytic leukemia (APL).

In our work, we focused on studying of interactions of As(III) and/or As(V) with DNA. Interactions between arsenic ions and DNA were monitored by UV/Vis spectrophotometry by measuring absorption and fluorescence spectra, atomic absorption spectrometry, electrochemical measurements (square wave voltammetry) and agarose gel electrophoresis. Using these methods, we observed a stable structure of DNA with As(III) within the concentration range 0.4 – 6.25 $\mu g.mL^{-1}$. Higher As(III) concentration caused degradation of DNA. However, similar effects were not observed for As(V).

Keywords: Anticancer drug; Arsenic; DNA Interaction; Electrochemistry; Spectrometry;

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