Abstract

The aim of this study is forced oxidative degradation of active pharmaceutical ingredient abacavir, used to treat HIV-infected patients. A fast and sensitive method for the determination of abacavir and its degradation products by ultra-high performance liquid chromatography has been developed and validated, that made it possible to evaluate the oxidation stability of abacavir and Ziagen tablets. Suitable chromatographic separation was achieved using a Kinetex C18 column and gradient elution with a mobile phase consisting of acetonitrile and ammonium acetate ($c = 20 \text{ mmoldm}^{-3}$, pH = 7.0). The total run time was 11 minutes. The determination of abacavir and its degradation products was performed by a photodiode array detector at $\lambda = 254 \text{ nm}$. The optimized method for the determination of abacavir and its degradation products was applied to study the oxidation of abacavir by both traditional and electrochemical approaches.

The forced degradation study in solution revealed abacavir instability in the presence of 3% hydrogen peroxide and during electrochemical oxidation. The study found that excipients in the tablet suppress the degradation of abacavir by approximately 10 %. Abacavir is oxidized by 15 % by hydrogen peroxide after 24 hours at 25 °C, after 1.5 hours at 50 °C and after 5 minutes at electrochemical oxidation. The oxidation of abacavir yielded three identifiable and known degradation products. The degradants $O_1$, $O_2$, $O_3$ with relative retention times 0.30; 0.40 and 0.45 were formed in the presence of 3% hydrogen peroxide solution while $O_2$ and $O_3$ with relative retention times 0.40 and 0.45 were electrochemically generated. Degradation products were identified by mass spectrometry and their $m/z$ are 303; 319 and 247.

Keywords

Abacavir, Ziagen, UHPLC, forced degradation, electrochemical oxidation