Pharmaceutical Regulatory Affairs: Open Access

Shintani, Pharmaceut Reg Affairs 2014, 4:1
DOI: 10.4172/2167-7689.1000e149

Editorial Open Access

Increased Sterility by Fenton Reaction and Increased OH Radicals upon UV Irradiation-Comparison of Sterility between Fenton Reaction and UV Irradiation to Hydrogen Peroxide

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Fenton reaction produces OH radicals from hydrogen peroxide with the catalyst of Fe^{2+} or Cu^{+}. The sterilization mechanism of hydrogen peroxide can be explained from OH radicals. If so using Fenton reaction, OH radical from hydrogen peroxide may increase and increased result of sterilization can be attained. Fe^{2+} was inoculated onto the sterilization pack and by contacting hydrogen peroxide with Fe^{2+}, Fenton reaction occurred. Production of OH radicals from hydrogen peroxide was increased and increased sterility efficiency can be confirmed from the comparison of D value to the control. The D values of hydrogen peroxide with Fe^{2+} and without Fe^{2+} were 5 s and 30 s, respectively, indicating OH radical formed greater by Fenton reaction. In addition, we studied the production of OH radicals from the UV exposure at 254 nm to hydrogen peroxide. The result of D values was compared with UV254 nm exposure and without UV 254 nm exposure, the D value of the former was 1.7 s and the latter was 3.3 s, respectively, indicating UV exposure supplied increased OH radicals. Furthermore sterility efficiency of Fenton reaction and UV 254 nm exposure was compared. Fenton reaction was inferior to UV 254 nm exposure due to the greater D value. The former was 5-10 s and the latter was 1.7 s. However, this comparison has a problem that primary package was absence and presence. UV exposure was absence and Fenton reaction was presence. Primary package present an obstacle to penetrate OH radicals into the interior of BI. As a conclusion, Fenton reaction was not always inferior to UV 254 nm exposure.

It was no doubt that Fenton reaction and UV 254 nm exposure was increased OH radical formation compared with control and UV-C exposure including 254 nm maybe superior to UV-B exposure on OH radical formation. This is due to shorter wavelength and shorter wavelength produced more energy by the equation of E=hv.

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Received February 16, 2015; **Accepted** February 18, 2015; **Published** February 23, 2015

Citation: Shintani H (2015) Increased Sterility by Fenton Reaction and Increased OH Radicals upon UV Irradiation-Comparison of Sterility between Fenton Reaction and UV Irradiation to Hydrogen Peroxide. Pharmaceut Reg Affairs 4: e149. doi:10.4172/2167-7689.1000e149