Determination of Ethylene Glycol and Diethylene Glycol as the Adulterant in Concentrated Glycerin, Glycerin and Propylene Glycol

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Abstract

Due to a fatal accident that occurred in 2006 for diethylene glycol (DEG) adulterated in glycerin, the Pharmaceutical and Food Safety Bureau in the Ministry of Health, Labour and Welfare (MHLW) has notified the partial revision of the purity test of Glycerin in the Japanese Standards of Quasi-Drug Ingredients (JSQI) 2006 at the Notification No. 1221004 on February 21, 2008. Since the fatal accidents caused by the contamination of syrup with DEG also occurred in 2009, USP proposed the purity test of concentrated glycerin, glycerin and propylene glycol about ethylene glycol (EG) and DEG as the adulterant instead of the purity test of concentrated glycerin and glycerin about DEG on May 21, 2009 to the Pharmacopoeial Discussion Group. In response to this, the Expert Committee on Excipients on JP made the decision to establish the new modified method. This paper proposes the new modified method of DEG including EG for the purity test in concentrated glycerin, glycerin and propylene glycol in JSQI 2006. This analytical method was the gas chromatographic method by using the fused-silica column 0.32 mm × 30 m coated with 14% cyanopropylphenyl/86% methylsilicon polymer and the column temperature for injecting at a constant temperature of about 100ºC and raising at the ratio of 7.5ºC per minute to 220ºC. The retention times of EG, propylene glycol, DEG and glycerin were 2.45, 2.78, 6.02 and 7.66 minutes, respectively. The working curves of EG and DEG were the good correlation between their concentrations of 2.5 to 80 µg/ml and the peak areas. The resolution between EG and DEG, and between DEG and glycerin were not less than 70 and not less than 20, respectively. Also those between EG and propylene glycol, and between propylene glycol and DEG were not less than 6 and not less than 60, respectively. The quantitation limits of EG and DEG in glycerin were 0.005% and 0.01%.

Key words: ethylene glycol, diethylene glycol, glycerin, propylene glycol, adulterant.

1. Introduction

In Republic of Panama of Central South America, Ministry of Public Health announced a mysterious disease in September 2006 and that the number of victims was raised up and 34 persons died on October 26, 2006. Ministry of Public Health found that the reason of the crucial accident was due to the anti-cold medicine including the diethylene glycol (DEG) in syrup prepared by the Panama Social Security Agency. Glycerin imported from China to Panama in 2006 was contaminated with DEG. The symptoms of the patients started with the diarrhea and attack of heavier, acute kidney incompletion and paralysis and reached to the death. Many patients were the men over 60 years old.

Also DEG was detected from the tooth pastes imported from China to the Republic of Dominica. FDA in USA ordered to stop the use of the Chinese tooth paste on June 1, 2006. The Ministry of Health, Labour and Welfare in Japan (MHLW) put out warning on May 29, 2007 about the detection of DEG in the tooth pastes made in China. MHLW notified that the manufacturer for the cosmetics and quasi-drugs should confirm whether glycerin has been contaminated with DEG or not. In consequence, DEG was so detected from the tooth pastes imported from China that the JTB Commercial Company has independently collected those contaminated tooth pastes.1)

On February 7, 2009, the Ministry of Health in Republic of Nigeria reported that total 84 children and infants ranged from 2 months old to 7 years old died due to the contaminated and harmful preparations including DEG in the analgesic syrups. Those preparations were used as the antifreeze mixture or the brake oil. The executives in that pharmaceutical company were arrested in the charge of the operational negligence. The Food and Drug Administration in Nigeria ordered the shutdown to the company.

The Pharmaceutical and Food Safety Bureau in MHLW notified the partial revision of the Japanese Standards of Quasi-Drug Ingredients (JSQI) 2006 at the Notification No. 1221004 on February 21, 2008.2) The items of the purity test (11) related substances of both the concentrated glycerin and glycerin in JSQI 2006 were changed into the DEG and related Substances. The proposed analytical method for testing DEG was added to this item. The limit of DEG in this item was not more than 0.1%.

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