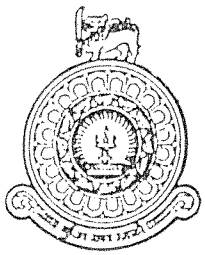

Exposure Analysis of Xylenes, Formaldehyde and Alcohol in a Histopathology Laboratory

A thesis submitted for the Degree of

Master in Analytical Chemistry

A.P.Kamalasiri
Faculty of Science
University of Colombo
May 2008

Abstract

Histopathology is one of the main disciplines in clinical pathology and histopathology laboratory plays a great role in diagnosis of cancers. There are about 50 such laboratories in Sri Lankan health sector including private hospital laboratories. Xylene, formaldehyde and alcohol are used in different quantities in different stages in the preparation of histopathological samples for analysis. Health workers are extensively exposed to these three groups of volatile compounds in their routine work. It is worrying to note that these workers are ignorant about the hazard they undergo and they silently suffer where even hospital authorities are not much educated about this fact. Air quality analysis of this nature has never been done in any of those health institutions in Sri Lanka. In addition, there is no scientific method of disposing of these waste fluids and storing the remaining tissue parts within the laboratory.

A particular medium scale laboratory in Colombo was selected which uses 10 liters of absolute alcohol, 5 liters of xylenes and 5 liters of 40% formaldehyde as its monthly consumption. Air quality was screened at work site, closer vicinity and distant vicinity by using photo ionization detector for alcohol, xylenes and formaldehyde. Levels of formaldehyde concentration were alarming in this particular laboratory whereas levels of alcohol and xylenes were below the potential risk levels. Photo ionization detector is very expensive and an average laboratory cannot afford to purchase such equipment for monitoring. Therefore a low cost technique was developed to assess the levels of formaldehyde which could be adopted in any histopathology laboratory in Sri Lanka without any additional cost.

Pararosaniline (basic fuchsin) when dissolved in water gives a deep red solution and when SO_2 is passed into the solution, colour disappears but re-appears when an aldehyde is added. This decolourised solution is known as Shiff's reagent in common use. Basic fuchsin and sodium metabisulphite are the main ingredients in this technique and those are commonly available chemicals in any histopathology laboratory. An apparatus was designed so that air was sucked with known flow rate through an impinger which contained Shiff's reagent and development of magenta colour was measured using a spectrophotometer at the wavelength of 540 nm. Calibration graph was prepared using standard analytical grade formaldehyde solution and Shiff's reagent. Sampling capacity was optimized by introducing additional impingers serialy and making maximum contact of air with solution. Analysis showed that the maximum level of formaldehyde is reported between 10.00 am -10.15 am and that exceeds the permissible level of short term exposure limit of 1 ppm prescribed by the National Institute for Occupational Safety and Health (NIOSH) based on chemical's irritant effect and in the light of carcinogenicity studies. Several recommendations are discussed in the thesis to minimize the exposure.