UNIVERSITI TEKNOLOGI MARA

A STUDY OF ACRYLAMIDE LEVEL IN POTATO CHIPS AND ITS RISK TO HUMAN HEALTH

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Acrylamide has been classified as a carcinogenic substance class 2A by IARC. It was previously considered as a hazard substance in industrial setting to workers exposed. However, in April 2002, Swedish National Food Authority (SNFA) announced the discovery of high levels of acrylamide formation in a wide range of high temperature heat treated carbohydrate -based foods such as potato chips, french fries and various fried foods. Presence of acrylamide in food is a major concern to humans based on its ability to induce cancer. Objectives of this study were to measure level of acrylamide in potato chips, to compare level of acrylamide between three brands of potato chips and to identify association between acrylamide exposure in potato chips and cancer risk. Acrylamide in potato chips sample (n=30) were analyzed by GC-FID. A cross sectional study was done to compare difference of concentration between three brands. Modified Food Frequency Questionnaires were distributed to respondents participated (n=100) to assess dietary intake of potato chips. Acrylamide concentration obtained in potato chips sample ranged from 78.93 to142.301 mg/kg. No significance difference (p-value >0.05, p = 0.133) of acrylamide concentration in three brands of potato chips. Cancer risk is significantly associated with acrylamide exposure in potato chips (p-value <0.05, p = 0.001). Acrylamide was found high in potato chip due to Maillard reaction involved. Acrylamide concentration was same for three brands because same type of frying oil was used. Cancer risk value was high in participated respondents where cancer risk value is > 0.01. Acrylamide was present in potato chips with significant amount and risk to develop cancer was associated with dietary acrylamide exposure. Critical control points of acrylamide formation were high temperature and shot cooking time. Further HACCP analysis of acrylamide formation in food should be done to ensure food safety among public.

Keywords: Acrylamide, Potato chips, GC-FID analysis, Food Frequency Questionnaire, Risk assessment.

CHAPTER 1

INTRODUCTION

1.1. Background.

Acrylamide (CH_2=CHCONH_2, CAS Registry Number 79-06-01) has been produced since the 1950s by hydration of acrylonitrile. It is used mainly to produce water-soluble polyacrylamides, used as flocculants for clarifying drinking-water, for treating municipal and industrial wastewater and as flow control agents in oil-well operations. Other major uses of ACR are in soil stabilization, in grout for repairing sewers and ACR gels used in biotechnology laboratories (International Agency for Research on Cancer [IARC], 1997).

ACR occurs in crystalline form and in aqueous solution. The solid monomer is a colorless to white, free-flowing crystal that is soluble in water, methanol, ethanol, dimethyl ether, and acetone, and is insoluble in benzene and heptane. It melts at 84˚C to 85°C and boils at 125°C. The crystalline ACR monomer is available as pellets of 98% and 95% purity. The 50% aqueous form is the preferred form for applications in water. The monomer readily polymerizes at the melting point or under ultraviolet light. Solid ACR is stable at room temperature, but it may polymerize violently when melted or in contact with oxidizing agents. When heated to decomposition, ACR emits acrid fumes and nitrogen oxides (U.S. Department of Health and Human Services [USDHHS], 2005).

ACR has been classified as group 2A which there is limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals (IARC, 1997). ACR is absorbed from all routes of exposure, which are ingestion, inhalation