NEUTRON ACTIVATION ANALYSIS OF MERCURY CONTENTS IN HEAD HAIR OF DENTISTS IN JAPAN

K. NOGUCHI, M. SHIMIZU, E. SAIRENJI

Radioisotope Research Laboratory, Nihon University
School of Dentistry, Chiyoda-ku, Tokyo (Japan)

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Mercury contents in head hair of 58 dentists employed at the NUSD hospital and 50 dentists employed at the private hospitals or clinics were determined using neutron activation analysis. The arithmetic means were 5.8 ppm and 5.2 ppm, and geometric means were 5.4 ppm and 4.8 ppm, respectively. They were much lower than the values reported in the past year, and agreed well with those of normal Japanese men of the same age. Therefore, it was concluded that the mercury pollution in the working environment of dentists might be practically non-existent in Japan today.

Introduction

In recent years, in connection with the problem of environmental pollution, much attention has been given to the effects of the intake into the human body of heavy metals such as mercury. Amalgams are frequently used as filling materials in dental clinics. For a long time, studies of mercury pollution affecting dentists due to amalgams have been reported: 1-7 for example, increased concentrations of mercury in the air of dental office rooms 1-4 as well as in the urine 1-4 and head hair 3,5-7 of dentists and dental hygienists due to the handling of amalgams.

However, at present, sufficient care is taken in the handing of amalgams in dentistry and in the control of mercury use in dental clinics. Therefore, it is expected that the mercury pollution affecting dentists is now less than that in the past. In order to determine the current exposure of dentists to mercury pollution, the authors analyzed mercury contents in head hair of dentists.

Experimental

Samples of head hair were taken from 58 male dentists employed at Nihon University School of Dentistry (NUSD) hospital in Tokyo Prefecture and from 50 male dentists employed at private hospitals or clinics in Kanagawa Prefecture. Their age distributions and employment year distributions are shown in Fig. 1.
The sampling method and washing procedure, which were recommended by the IAEA Advisory Group\(^8\) for the applications of nuclear methods in environmental research, were strictly followed. After washing, each sample was air-dried, weighed, and heat-sealed in polyethylene envelopes.

The standard mercury solution used in this study (1 mg Hg/ml) was prepared by dissolving mercury(II) oxide (HgO) in a 0.2N HNO\(_3\) solution. This standard solution was diluted five times and 100 \(\mu\)l of it was pipetted onto filter papers (two pieces, 2 cm X 2 cm), which were washed with a dilute nitric acid solution previously. In order to avoid loss of mercury during and after neutron irradiation, an excess quantity (70 times the moles of mercury) of a 1% thioacetamide (CH\(_3\)CSNH\(_2\)) solution was immediately added to the standard mercury sample.\(^9\),\(^10\) The standard sample was heat-sealed in a polyethylene envelope and kept in the freezer until neutron irradiation. To correct the contribution of \(^75\)Se to the 279 keV photopeak, the standard selenium sample was made as follows. The standard selenium solution (10 mg Se/ml) was prepared by dissolving selenium dioxide (SeO\(_2\)) in a 0.2N HNO\(_3\) solution. This standard solution was diluted 100-fold and 100 \(\mu\)l of it was pipetted onto filter papers treated as mentioned above. After air-drying, the sample was heat-sealed in a polyethylene envelope.

The samples were irradiated for one hour with a thermal neutron flux of \(2 \times 10^{13} \text{ n cm}^{-2} \text{ s}^{-1}\) in the pneumatic irradiation facility of Kyoto University.