

Lead and cadmium in indoor dust in Japanese houses – relationship with outdoor sources

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Abstract

This study was carried out as a part of a project to identify the source(s) of Pb in indoor dust in dwellings in Japan. Because of unique features with regard to Pb in Japan - early phase-out of leaded gasoline and no tradition of painting the interior/exterior of houses - Japanese houses lack the definite Pb contamination sources (paint and leaded gasoline) that are known to occur in other developed countries. Indoor dust, outdoor dust and soil samples were collected from 41 households in Japan and Pb and Cd concentrations in the samples (<250 µm fraction) were measured by ICP mass spectrometry after HNO₃/HClO₄/HF digestion. Median concentrations of Pb and Cd were 54.1 and 0.932 mg/kg, 31.7 and 0.563 mg/kg, and 153 and 1.74 mg/kg for indoor dust, soil and outdoor dust, respectively. The concentrations of Pb and Cd in indoor dust were lower than those previously and currently reported, indicating that dwellings in Japan are less contaminated with these metals than are those in other countries. Indoor dust Pb and Cd concentrations were only weakly correlated with outdoor metal concentrations and did not correlate with household variables (household type, presence/absence of smoker or pet, heating fuel and type of flooring). The results indicated that there were unknown factors that affect indoor dust metal concentrations in Japanese households.

要 旨

日本の住居の室内塵中鉛およびカドミウム—室外汚染源との関連

汚染源が明確になっていないわが国の室内塵中鉛及びカドミウムについて、その汚染源として室外起源を想定して検討した。国内41の家庭から、室内塵、周辺土壌、室外ダスト(窓枠にたまったダスト)の提供を受け、それらに含まれる鉛及びカドミウム濃度を混酸分解—ICP質量分析法により定量した。それぞれの試料の鉛濃度は54.1, 31.7, 153 mg/kg, カドミウム濃度は0.932, 0.563, 1.74 mg/kgであった(いずれも中央値)。室内塵中鉛、カドミウム濃度は諸外国で行われた既往の研究の結果に比べて低い濃度であり、わが国の室内塵汚染のレベルが低いことが伺われた。室内塵中鉛、カドミウム濃度は、周辺土壌、室外ダスト中濃度とごく弱い正の相関関係があったのみであり、室外汚染源はほとんど寄与していないと解釈できる。これは諸外国で得られている結果と異なるものである。また、これらの濃度は住居・居住者関係の変数(戸建て/集合住宅、喫煙者・ペットの有無、暖房の種類、床材質)との関連も見られなかった。今回検討した以外の住居・居住者関連要因が室内塵中の鉛やカドミウム濃度の決定要因であると考えられた。

Key words: cadmium(カドミウム), indoor dust(室内塵), lead(鉛), outdoor dust(室外塵), soil(土壌)