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Safety Evaluation of Inorganic Antimicrobial Agents (2) —Elution of Metals with Artificial Sweat and Saliva from Inorganic Antimicrobial Agents and Processed Cloths—

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Abstract:

In Europe, the standard levels of heavy metals eluted with artificial sweat and saliva are specified in the self-imposed safety criteria (OEKOTEX Standard) for textile products. To establish standard values in Japan, we prepared metal zeolites (Ag, Cu, Zn, and Cr) and standard cloths processed with these zeolites and a silver antimicrobial agent, AG300. The agents, standard processed cloths, and regions of commercial textile products in which metals were detected at a high concentration were subjected to metal elution with artificial sweat (JIS L 0848: 2004), saliva (BS 6684: 1987), and ultrapure water according to the JIS shake-flask antimicrobial test method (JIS L 1902-1900). The metal concentrations in the extracts were measured using an inductively coupled plasma-mass spectrometer (ICP-MS). A similar tendency was noted in elution from the agents, standard processed cloths, and commercial textiles. Small amounts of metals were eluted with water alone, while large amounts were eluted with artificial sweat and saliva. Large amounts of Cu and Zn were eluted, while the elution of Ag was low, and almost no Cr was eluted. Furthermore, antimicrobial activity of the standard processed cloths was evaluated by the standard test (JIS L 1902) using Staphylococcus aureus and Klebsiella pneumoniae. Cu- and Ag (Ag zeolite and AG300)-processed cloths exhibited high antimicrobial activities against both bacteria. Zn-processed cloth also showed antimicrobial activity against S. aureus.

Key words: inorganic antimicrobial agents, artificial sweat, artificial saliva, elution of metals, inductively coupled plasma atomic emission spectroscopy, inductively coupled plasma-mass spectrometer, evaluation of antimicrobial activity

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