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# Unprecedentedly migration of lead and other metals from artisanal cookware to simulants and foods

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Wold wide, studies have been carried out on the contact of food with stainless steel kitchen utensils and most of them showed a releasing of several metals in "similants" or in a representative food. Kitchen utensils, as unrecognized exposure sources, can cause significant public health risks throughout the developing world. The objective of this study was to investigate the releasing of metals in similants and in some representative foods from artisanal cookwares.
We conducted an experimental study on 9 samples of cookware collected in six cookware manufacturing workshops located in Lubumbashi city. three samples of cookwares for each type of samples (Artificial tape water, citric acid and food cooked in the local context) were used for migration test, one cookware of food was excluded because of unsaficiant data. The preparation and the migration test of smilants were done according to the pratical guide for manufacturers and regulators published by the European Directorate for the Quality of Medicines & HealthCare of the Council of Europe (1st Edition) and the Practical Guidelines for Performing FCM Metal/Alloy, Ceramic and Plastic Migration Testing for Metal Migration and Reporting of Results of Sciensano [SRL(µg/kg): Al(5000), V(10), Cr(250), Ni(140), Zn(5000), Tl(0.1) et le Pb(10)]. Two normes of Specific Release Limit (SRL) ((3rd MT > SLR and 1st + 2nd MT > 7.SLR); MT: concentration of migration test) were considered. We also collected randomly on the workspace of 4 workshops 4 samples of alloys, obtained after cookware polishing, and one maleable metal used to plug cookware's holes, for chemical composition analysis. Metal determination was performed using Inductively Coupled Plasma Mass Spectrometry (ICP-MS).
The alloys collected showed concentration mean (g/kg) of Mg(3.5), Al(521.9), V(0.34), Cr(0.16), Mn(1.3), Fe(12.8), Co(0.02), Ni(0.5), Cu(11.1), Zn(4.2), As(4.10-6), Cd(15.10-4) and Pb(0.5), and the one sample of maleable metal showed (g/kg) Mg(0.752), Fe(0.624), Co(0.002), Ni(0.091), Cu(2.201), As(13.10-3), Cd(523.10-4), Tl (816.10-4) and Pb(1015.8).
In regard to experience of migrations, for each type of similiant and food sample used for the eight cookwares, only seven elements (Al, V, Cr, Ni, Zn, Tl and Pb) showed concentrations above the standards.
For citric acid, the aluminum concentrations obtained after the migration tests were above the required safe standards (3rd MT > SLR and 1st + 2nd MT > 7.SLR), whereas for ATW, one of the two standards were not met (3rd MT > SLR) . The vanadium concentrations in the AC samples collected after testing met only one standard (3rd MT > SLR), whereas for the ATW, the migration standards were met. With regard to lead, two cookwares out of the three collected showed concentrations higher than the two standards (3rd MT > SLR and 1st + 2nd MT > 7.SLR) and the other one did not met one of the standards (1st + 2nd MT > 7. SLR). For the migrations in the ATW, only one cookware showed concentrations above a standard (3rd MT > SLR). Concerning beans, the migrations were beyond the norms for Pb only (3rd MT > SLR and 1st + 2nd MT > 7.SLR), as for sorrel, Al, V, Cr, Ni, Zn, Tl and Pb migrated beyond the standards (3rd MT > SLR and 1st + 2nd MT > 7.SLR).
These findings support that consumers using atisanal cookwares in developing countires are exposed to metals, especialy to lead and warns on the use of pure lead in the manufacture process of some cookwares. Studies on the types of row materials used for cookware manufacture are needed to identfy the factors influencing the composition of cookware, consequently the relesing of metals in food.

**Keywords**: Artisanal cookware, migration of metals, lead, low income countries

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