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Sustainable Nanotechnologies Project

Silver release from nano-silver containing plastic food containers

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Introduction / Materials & Methods

The potential migration of AgNP into food and during washing, scrubbing, etc. has been poorly addressed; however, it is essential for the purpose of human and environmental exposure assessment.

Experimental setup:

Migration assay was set up following European Commission Directive 97/48/EC for articles intended to be in contact with food.

Four brands of commercially available plastic food containers were incubated for 10 days at 40°C with three different food simulants: Milli-Q water, 10% ethanol, and 3% acetic acid.

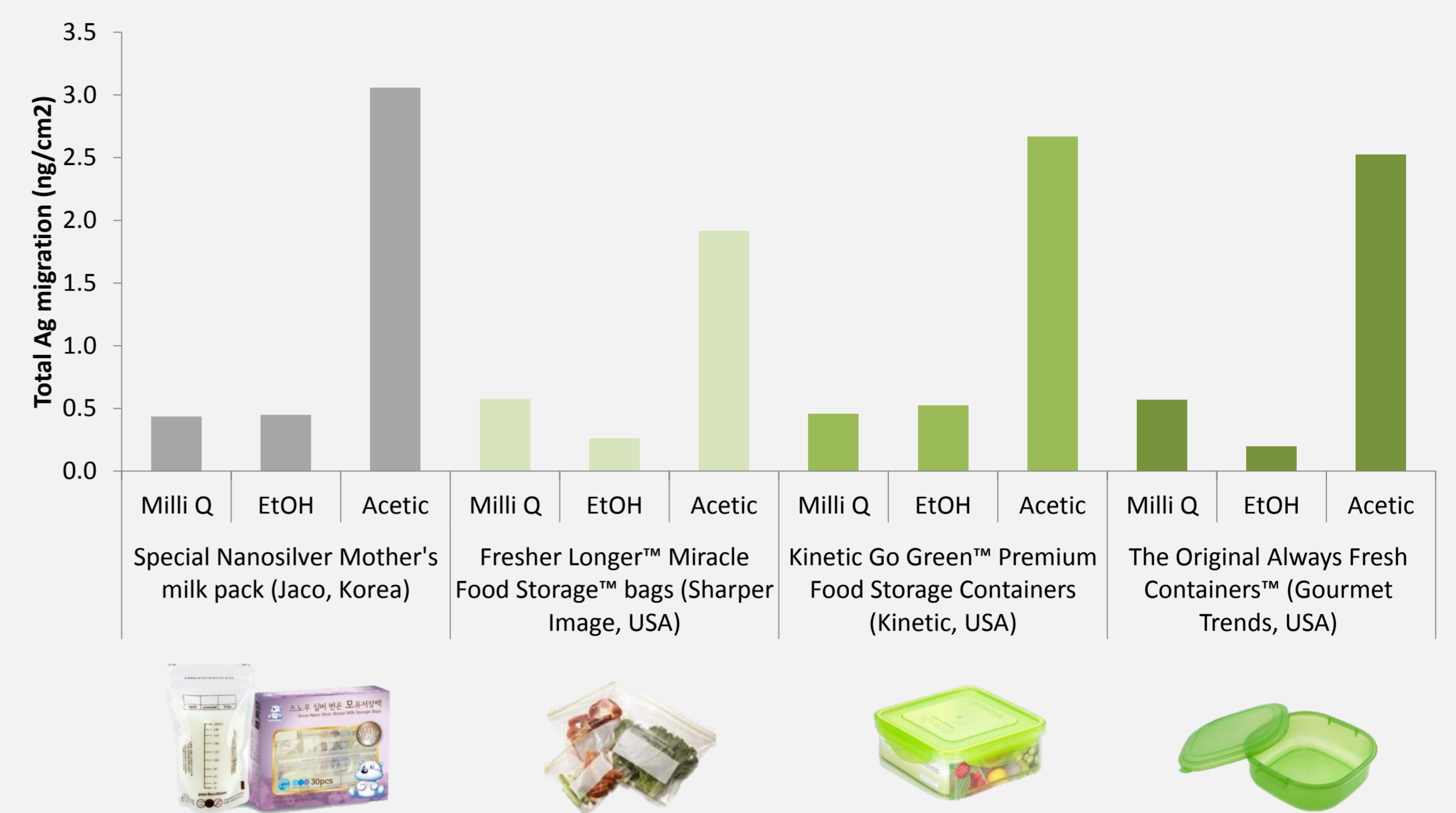
Analysis:

The total amount of silver in plastic containers (day 0) and migration solutions (day 10) was quantified by ICP-MS analysis.

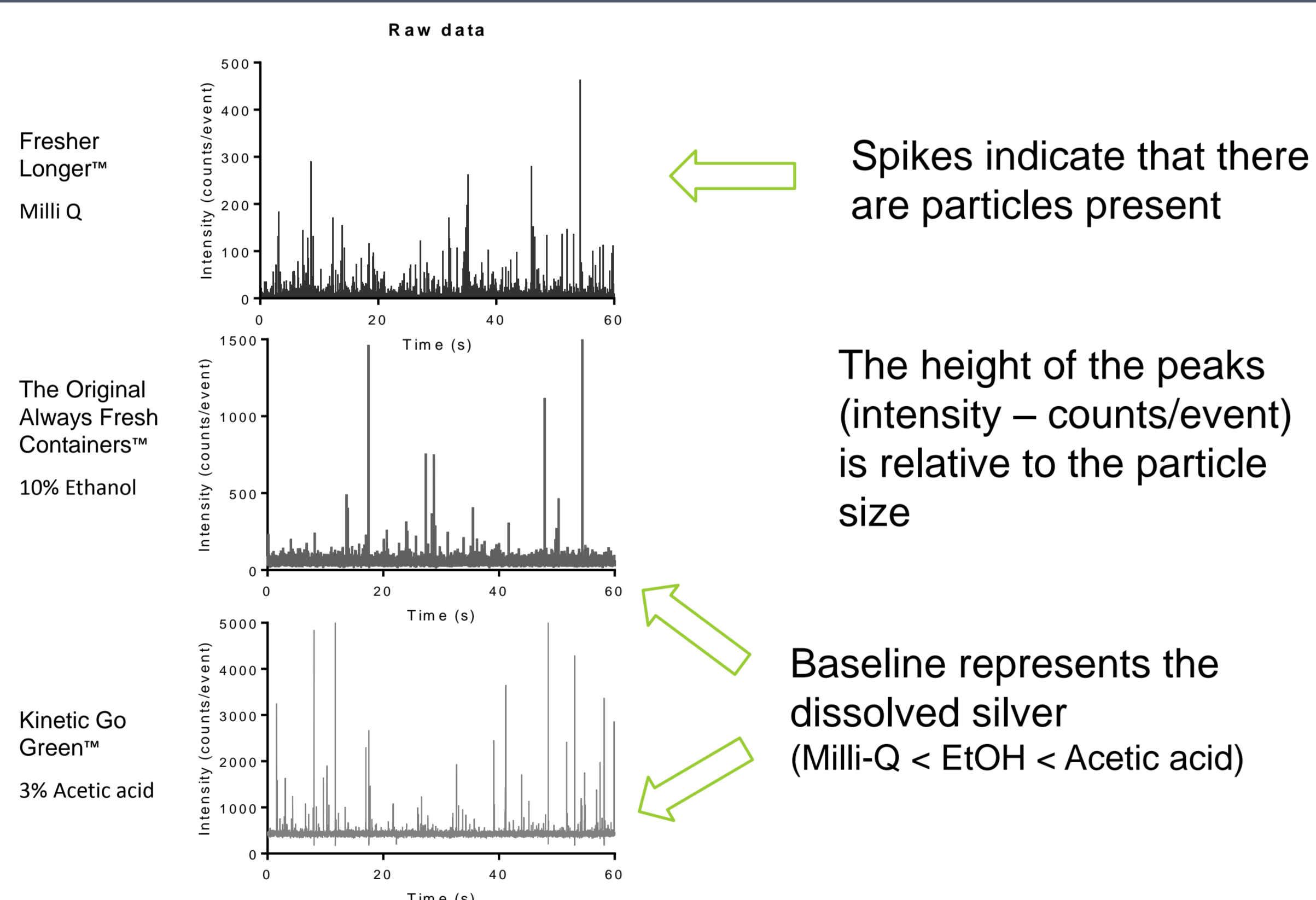
The size of the migrated particles was investigated by

- single particle ICP-MS (Agilent 7700x)
- TEM-EDS imaging (FEI Tecnai G2)

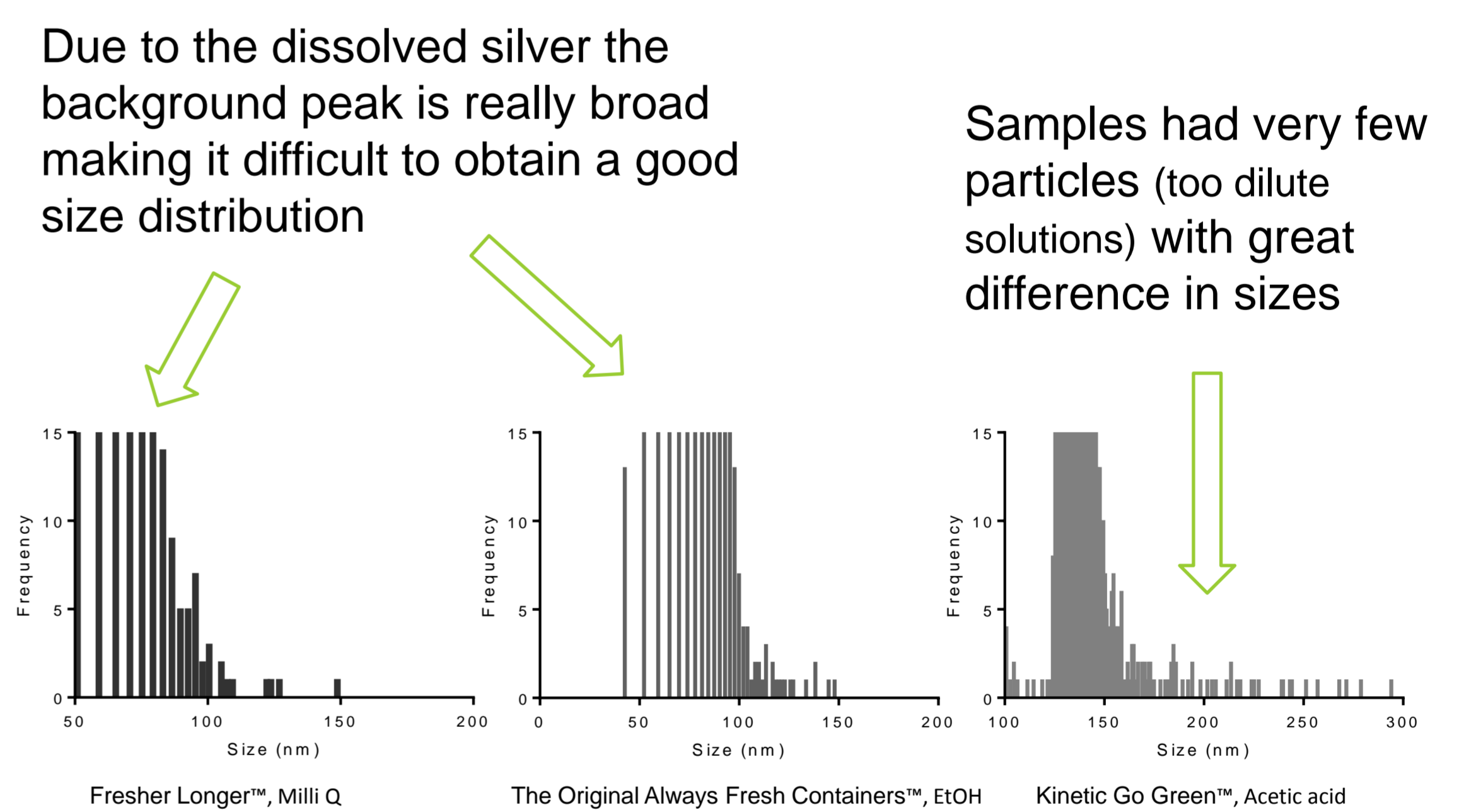
Results – total silver migration



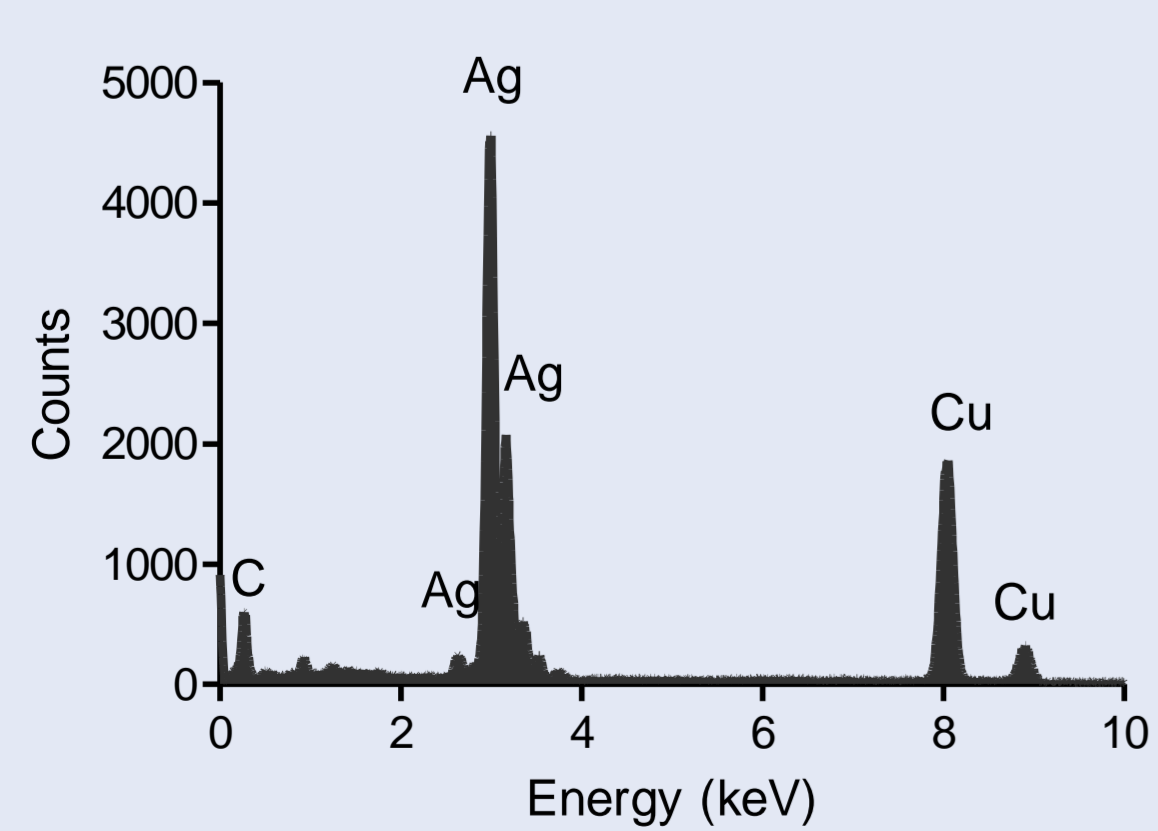
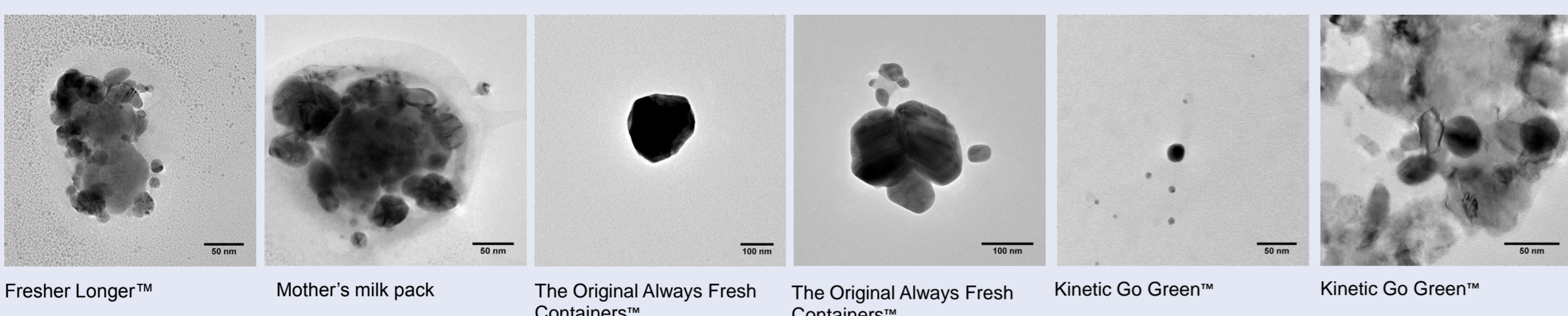
Results – single particle ICP-MS



Results – single particle ICP-MS



Results – TEM-EDS



TEM Images obtained from migration solution samples after 10 days in 3% acetic acid

- EDS spectra confirmed that particles found consisted of Ag
- Both dispersed and agglomerated particles were observed
- AgNP sizes were ranging from around 20 nm to more than 200 nm

EDS spectrum from The Original Always Fresh Containers™ sample

Discussion / Conclusions

- Highest migration of total silver was observed in acetic acid for all four brands
- Single particle ICP-MS results showed that in acetic acid there was more dissolved silver found than particulate silver
- The presence of AgNP was confirmed by TEM-EDS analysis for all acetic acid samples
- The brand with highest release of Ag (ng/cm²) was Special Nanosilver Mother's milk pack from Jaco, Korea
- The highest content of Ag (per cm²) was measured for The Original Always Fresh Containers™

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